The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

VOL. IV. MARCH 5, 1921 No. 90

Contents

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

The prepaid subscription to "The Chemical Age" is 21/- per annum for the United Kingdom, and 26/- abroad. Cheques, P.O.O.'s, and Postal Orders should be made payable to Benn Brothers, Ltd.

Editorial & General Offices—8, Bouverie Street, London, E.C.4.

Telegrams: "Allangas, Fleet, London." Telephone: City 9852 (4 lines).

The New Bill Before Easter

MR. LLOYD GEORGE announced in the House of Commons on Monday that he hoped it would be possible to introduce before Easter a Bill to safeguard key industries and to regulate imports, so that the measure might be proceeded with as soon as the House reassembles. The precise scope of the measure is not yet known. The Cabinet, it is reported, are anxious to limit it as far as they can consistently with their pledges and with their regard for national interests, in the hope of correspondingly restricting the inevitable hostility of the Free Trade minority. The main principle of the measure, however, may be taken for granted. The form of protection to be applied to our key industries generally will be that already applied to the dyestuffs industry, namely, the limitation over a period of years of competitive imports under a licensing system. The Government majority will undoubtedly be at the service of the Government in pressing such a measure through. As we have pointed out before, the nation has only two choices in this matter. Either it must go back frankly to the old Free Trade position, as it existed before the war, with its many and substantial advantages to the consumer, but also, as we found to our cost during the war, with very grave risks in the event of foreign supplies of essential products being cut off; or it must establish, possibly at considerable temporary cost and inconvenience, British industries capable of providing for all national needs. For the advantages to be secured by the Bill a price must be paid, and the nation is prepared to pay it. The essential thing is to see that the price represents a fair bargain between the nation and the manufacturing interests to be protected.

The campaign on behalf of the fine chemical industry has already begun. One can scarcely open a daily journal of any position without seeing the case stated by some eminent scientist or well-known public man. It is generally stated with skill and with an eye to the psychology of the average citizen; it is, so far as we have seen, stated fairly, and in a way likely to carry conviction. A few samples may be mentioned. Dr. Jowett, the manager of the well-known firm of Burroughs, Wellcome & Co., Dartford, points out that at this stage the unlimited competition of Germany with British industries only recently established must end in the latter being crushed out, and that means the loss of the outlay on plant, &c., already incurred, the loss of employment to a considerable number of British workmen, and a loss all round to the nation. He thinks that a period of 10 years should be sufficient to enable British fine chemical manufacturers to hold their own against Germany. Mr. G. H. Roberts, M.P., discusses the same problem with a technical intimacy which is surprising as well as convincing. He shows the immensely important part which chemistry plays in bacteriological and antiseptic surgery and the very creditable progress we made during and since the war in research and actual production. "In nearly every case," he states, "where the manufacture of medicinal and other fine chemicals had been taken up by British manufacturers as the result of the war's demands, chemicals of a similar nature are making their appearance on the British market to-day from German sources. Other fine chemicals which are not being made in this country are selling at grossly enhanced prices, from six to eight times the pre-war prices in British currency. Payment for the latter at the present rate of exchange brings an enormous profit in marks to the German manufacturer. He can afford to undersell the home chemist in regard to those chemicals which are actually made in this country: for what he loses on the swings he gains, and more than gains, on the roundabouts."

Sir Reginald Blair, M.P., puts the case from yet another point of view—the utilization of the vast natural resources of the Empire for the production

of fine and especially pharmaceutical chemicals for the needs of the world. "It is the earnest hope of many of us," he writes, "that our country will indeed in the near future make, not for the British Empire only, but for the other nations of the world, too, those fine chemicals which once were almost a German monopoly. The British fine chemicals industry seeks no unfair advantage. It is entitled to ask the Government to provide adequate safeguards until the industry has found its feet. Unless this is done the industry, already stagnant, will die, and a vast amount of capital will be lost to the nation. Given some relief from German dumping during the early years of development, the industry will be enabled to renew its activities and after a while manufacture on a large scale. The matter is of even greater importance to the British workman than to the British employer, for the latter could import the finished fine chemicals from Germany and sell at a profit in England; but such a scheme is a melancholy prospect for the British workman."

The last opinion to be noticed is that of Captain Bertrand Watson, M.P., who paints a glowing picture of Germany's scientific and technological activity in the past, and especially of the team work of her great chemical manufacturing concerns. This might easily be perverted into a very emphatic vote of censure on British chemical manufacturers who are really in their present position to-day because they failed to do what their German rivals did. Censure of past neglect, however, is no remedy for the present difficulties, and Captain Watson, we are glad to see, puts the case on grounds too often ignored. The British fine chemical manufacturer, he points out, "must have the necessary financial means for factory operations, and large sums must be spent in extending the scientific side of his activities. Libraries and laboratories must be fitted up and extended and a staff of chemists trained for the supervision of different processes, while adequate buildings and plant must be set up. An efficient educational system must be provided for training students in polytechnics, university colleges and universities, with the object of fitting them for research and scientific industrial vocations." These, of course, are the inherent conditions of success. If the Key Industries Bill secures them, it will fully justify itself. If, on the other hand, it is treated as an artificial substitute for them, it will fail. Our future really depends on whether the manufacturer takes a long or a short sighted view of the situation.

Flotative Reagents

In our issue of February 12 we discussed the feasibility of applying the froth flotation principle to the problem of cleansing coal, the quality of which still leaves very much to be desired. As is well known, the flotation process embodies the treatment of mineral ores with water to which a "reagent" is added. This results in the formation of a number of small bubbles to which the lighter particles of the mixture undergoing treatment become attached. In other words, the separated particles are adsorbed by the reagents, forming a surface concentration thereon. There is not very much information available as to the character and extent of the reagents commonly employed for mineral separation, so that a comprehensive series of statistics recently published in America should prove of more than passing interest. In April, 1919, the United States Bureau of Mines sent round a request for information as to the quantities of ore treated by gravity concentration and flotation, the amount of concentrates produced by each system, and the consumption of oils, acids or other reagents utilised. Figures were given by practically all of the more important undertakings, and these showed that no fewer than 26 million tons of ore are now treated per annum by the flotation method, the average results indicating that 1 ton of concentrates is obtained from 8·55 tons of ore. The materials treated consisted mainly of copper ores, the remainder being lead, lead-silver, zinc, gold-silver, and graphite ores, while the system was also applied in connection with such materials as molybdenum and antimony, and the more difficult complex mixtures.

As regards flotative reagents, in this country—more particularly for coal separation—an oil or tar product is employed, about one pound of reagent being required per ton of coal mixture dealt with. In America the flotative substances most generally used for copper ores are sulphuric acid, kerosene acid sludge, and coal tars. For lead and silver ores creosote obtained from the distillation of hard woods is most common, although in some instances use is made of coal tar, crude petroleum, and pine oils. For zinc ores the most effective reagent appears to be pine oil, but sulphate of copper and creosote are also effective. It is surprising, in fact, what a large selection of substances may be employed as effective flotatives; for, in addition to those mentioned above, recourse is often had to sulphur, ammonia, and various salts of sodium and ammonia. American experience shows that in the treatment of ores (as distinct from coal mixtures) for the production of concentrates the quantity of the reagent required amounts to approximately $4\frac{1}{4}$ lb. per ton of ore treated.

A New Use for Palm Oil

Liquid fuels up to the present have consisted almost solely of the distillates from mineral oils, the vegetable products—mainly owing to cost—having never aroused anything more than academic interest. Castor oil certainly was given a fairly extensive trial as a fuel for internal combustion engines some years ago, but it resulted in a considerable amount of corrosion owing to the formation of acetic acid. At a recent meeting of one of the Belgian technical associations particulars were given by Major Trentels of some novel work carried out with palm oil as a fuel. The present, perhaps, is not the most propitious time for employing vegetable products for power, for there is still an immense demand for the majority of edible oils for such purposes as margarine manufacture. Palm oil, however, presents certain difficulties in this respect, and although its refinement and ultimate fitness for edible purposes may, no doubt, be general in the course of time, there will always remain a large residue for turning to other purposes, amongst which soap-making is likely to remain the most prominent. The supply of motor fuel in the haunts of the palm fruit is a question which is becoming more and more acute,

while the cost of the former is about eight times as great as that of the palm oil.

The fuel tests with palm oil have been carried out with a semi-Diesel engine of about 10 H.P., and the only really special feature introduced was the means for ensuring that the oil is maintained in a sufficiently liquid state. To this end the cylinder cooling water is passed, together with the exhaust gases, around the oil feed tank, while a petrol vapour lamp is placed beneath the tank. The consumption of palm oil amounts to from about 11 to 19 ounces per horse power hour, the calorific value of the oil being 16,600 B.Th.U. per lb. In order to ensure complete vaporisation of the oil, and perfect intermixture of the oil-mist and air, a small quantity of water is injected into the cylinder. In this way the products of combustion are absorbed by the water vapour and burnt gases; and, being removed through the exhaust, ensure complete combustion and eliminate the risk of premature ignition. The injection of water is automatically regulated in accordance with the fuel consumed and demanded by the load. The experiments should prove of considerable interest to producers of all vegetable oils, for cultivation is in many cases being intensified and extended; and, although there is no indication of it for the moment, the time may come when the supply will considerably exceed the demand, in which case hitherto unrecognised outlets for consumption may prove of decided value.

U.S.A. Dyestuffs Legislation

WHILE in this country we are speculating on the character and prospects of the new Key Industries Bill and settling some administrative problems arising under the Dyestuffs Act, our friends in the United States are still concerned about the fate of the long-discussed Longworth Bill. They are usually supposed to be pretty good at organising "hustles," but in this case the organisation appears to have been mainly in opposition to the Bill—just the opposite of the position here. The delay in taking measures to protect the American chemical and dyestuff industry is causing considerable alarm. "It can be stated," *Chemical & Metallurgical Engineering* says, "almost with certainty that legislation to protect our dye industry will not be enacted at this session of Congress." *Drug & Chemical Markets* assures us that the principal interest of all concerned in the chemical and drug industries has centred in the tariff question, and that the uncertainty as to the future has had a marked effect in preventing the expansion of plants and the perfection of processes in the coal tar industry. The controversy, it adds, on the tariff question has become bitter in some cases, "and every possible trick of the trade has been brought into play to bring the measure to defeat."

The tone of the American chemical press is further illustrated by the comments of *The Journal of Industrial & Enginering Chemistry* on the recent importation of German dye experts, engaged at reported salaries of $25,000 each by the du Pont Company. Apart from the effect such appointments would have on American research staffs, it points out the discouragement which must possess the officials of the du Pont, as of every other American dye manufacturing concern, over the failure of Congress to enact definite and adequate protective legislation." Pleading for the training of efficient research staffs from among American chemists, it declares that it is not too late to repair the damage. "There are eastward-bound steamers constantly travelling across the Atlantic. Whatever the ability of these two chemists, however intimate their knowledge of special lines of manufacturing may be—send them home and let the American industry proceed to its full development in an American way and by the force of American brains." It sounds rather like the breezy and uncompromising Dr. Herty.

The Calendar

Mar.		
5	The Institution of British Foundrymen (Lancashire Branch): "Some Experiences in Cupola Practice," by J. Pell. 4 p.m.	College of Technology, Manchester.
7	Royal College of Science, Chemical Association: "The Edible Oils and Fats," by E. L. Campbell. 4.30 p.m.	Royal College of Science, Dublin.
7	Society of Chemical Industry (Newcastle Section) and The Cleveland Institution of Engineers'—Joint Meeting: "Alcohol from Coke Oven Gas," by C. F. Tidman. 6.30 p.m.	Corporation Road, Middlesbrough.
7	Society of Chemical Industry (London Section): "Factors Influencing the Food Value of Lard and Lard Substitutes," by J. C. Drummond; "The Stability of Benzoyl Peroxide," by R. C. Farmer. 8 p.m.	Burlington House, Piccadilly, London.
8	Society of Chemical Industry (Edinburgh Section)	Edinburgh.
8	The Sheffield Association of Metallurgists and Metallurgical Chemists: Surface Phenomena in Liquid Steel," by Cosmo Johns	Sheffield.
9	Institute of Metals: Annual General Meeting. 10.30 a.m. and 2.30 p.m.	Institution of Mechanical Engineers, Storey's Gate, London.
9	Society of Chemical Industry (Newcastle Section): "Lubrication and Lubricants," by L. Archbutt. 7.30 p.m.	Armstrong College, Newcastle-on-Tyne
10	Society of Chemical Industry (Birmingham Section)	Birmingham.
10	Institute of Chemistry... ...	North West Hotel, Liverpool.
10	Royal Society: Papers by Sir Joseph Larmor; Lord Rayleigh; Professor A. S. Eddington; Professor T. R. Merton; Professor W. A. Bone; H. N. Russell	Burlington House, Piccadilly, London.
11	Royal College of Science Union, Chemical Society: "The Chemistry of Cooking," by Miss G. E. Hickes and Miss K. A. James	Royal College of Science, South Kensington, London.

Books Received

AMMONIA AND THE NITRIDES. By E. B. Maxted, London: J. & A. Churchill. Pp. 120. 7s. 6d. net.

COCOA AND CHOCOLATE: THEIR CHEMISTRY AND MANUFACTURE. By R. Whymper. Second edition. London: J. & A. Churchill. Pp. 568. 42s. net.

PHYSICAL AND CHEMICAL CONSTANTS AND SOME MATHEMATICAL FUNCTIONS. By G. W. C. Kaye and T. H. Laby. London, Longmans, Green & Co., Pp. 161. 14s. net.

Recent Progress in Rubber Chemistry and Technology—(I)

By Dr. Philip Schidrowitz

As previously announced THE CHEMICAL AGE *has made arrangements with Dr. Schidrowitz to contribute a series of articles bearing on the chemistry and technology of rubber. The series will consist of five articles, the first of which appears below and deals in particular with the planting, tapping, and working-up of rubber. Attention is drawn to the fact that rubber is a typical colloid, being frequently employed for its specific colloidal properties—a point which has certainly not been generally appreciated. In subsequent articles Dr. Schidrowitz will review in detail the process of manufacture, dealing with vulcanisation, the synthesis of rubber, and the utilisation of colloidal clay and various fillers. The articles will, in fact, form the latest and most authentic account of an industry which within the past decade has become one of first-class magnitude.*

ALTHOUGH rubber was known as far back as the sixteenth century, and Macintosh's proofing of garments with the (unvulcanised) material in about 1825 may be regarded as the starting point of the industry, no actual large-scale developments were possible until after and because of the discovery of vulcanisation (Goodyear, 1839; Hancock, 1844). Nevertheless, the progress made until about 30 years ago was very slow, and it is only within the last decade that rubber manufacture has become an industry of first-class magnitude. Since 1910 the total production of crude rubber has increased from something like 90,000 tons to close on 400,000 tons, and whereas in 1890 the capitalised value of the various branches of the industry probably did not exceed 15 to 20 millions sterling, the present-day figure cannot well be less than 400 millions, and very likely is represented by a larger sum. The discovery of vulcanisation, the development of plantation rubber, and finally (the most important of all) the advent of motor traction and the evolution of the rubber tyre, are the three great landmarks on the rubber industry's high road.

Plantation Rubber

The production of plantation rubber has risen from 510 tons in 1906 to approximately 350,000 tons at the present time (1920). Similarly, while the percentage of plantation to total crude rubber was less than 1 per cent. at the former date, it now constitutes over 90 per cent. of the total, and it is more than probable that in a few years the output of "wild" rubber will be entirely insignificant. Less than 20 years ago there was no crude rubber *industry*; the manufacturer was mainly dependent for his raw material on the more or less haphazard and uncontrolled efforts of savage or semi-savage "natives" working in primeval forest or jungle. To-day rubber is produced on a scientific basis comparable with that of the beet sugar or potato spirit industries.

Selection of Seed

Substantially all plantation rubber is derived from *Hevea Brasiliensis* from seed obtained originally from South American forest areas by Wickham, but while it is now recognised that there is great variability in the yielding capacity of the trees, the question of seed selection has only of late come into prominence. Thus Whitby* has recorded figures based on the yields of 1,011 trees on a normal area, showing that 9·6 per cent. of the trees yielded 3·6 times as much rubber per tree as the remainder, and while, on the one hand, 9·6 per cent. of the trees contributed 28 per cent. of the total yield, 13·7 per cent. were contributing only 2·9 per cent. The results obtained on experimental areas planted with selected seeds, &c., suggest that not only should future plantings be from selected material, but that the thinning out of already planted areas should be on a selected basis.

* *Ann. Bot.* 1919. 31. 313.

Para Seed Oil

The *Hevea* yields a large crop of seeds, and as these contain a high proportion of an oil—sufficient on the basis of the planted acreage to supply several million gallons—the nature of the latter has formed the subject of considerable investigation. Spring and Day* estimated the average annual yield of seeds as 400 per tree, or 306 lb. per acre of 90 trees, and the oil yield of the semi-dried kernels to be 47·5 per cent. (or 27 per cent. on the original seeds). The oil, while inferior to linseed as regards drying properties, appears likely to prove a useful substitute for the latter for some purposes. An investigation of its properties at the Imperial Institute yielded the following results: Sp. gr. 15°, 0·925-0·930; acid value, 10·7-40·9; saponification value, 188·5-192·1; iodine value, 128·3-143·3 per cent. The analytical figures obtained with the cake were similar to those for linseed cake, and feeding trials showed that it is a satisfactory cattle feed. Gorter,† it may be mentioned, isolated a cyanogenetic glucoside from the seeds, which was found to be identical with phaseolunatine, obtained by Dunstan and Henry‡ from the *phaseolus lunatus* bean.

Spacing

In the early days of the industry the desire for a quick yield led to close planting, and spacings corresponding to 200 to 400 trees per acre were common. It has now been definitely ascertained that this policy was a mistake, and it is recognised that the trees should not exceed 80 to 100 per acre. Many of the older growths have been vigorously thinned out, but thinning involves much labour, and if not carefully carried out, decaying stumps are left in the ground, and may lead to disease.

Tree Diseases

A number of diseases, as might have been expected in the case of a tropical growth reared on cleared jungle land—much of it unprotected by forest belts—have put in an appearance, but none of these has so far developed to any serious extent, thanks mainly to the study and unceasing watch of the mycologists, botanists and entomologists on the spot. Nevertheless, these diseases have to be fought continuously and on an organised basis. One of them, namely, *Brown Bust*, is causing considerable anxiety, particularly as it has so far defied all efforts directed to ascertain its character.

Tapping and Formation of Rubber

It is fairly generally known that the method of obtaining the latex from the tree consists in cutting away the bark in such a manner as to penetrate into the laticiferous system (which is quite distinct from the ordinary sap system) without injuring the *cambium*. In the early days it was customary to "tap" by methods now recognised as

* *Agricul. Bull. F.M.S.* 1918. 6. 231.
† *Rec. Trav. Chem.* 1912. 36. 264.
‡ *Proc. Royal Soc.* 1904. 72. 285.

too drastic. The full or half-" herring bone " and " spiral " systems (covering upwards of a half of the circumference and much of the whole area) have long since disappeared, and the V-system, consisting of two cuts united in V-form, each over a quarter of the circumference, employed until quite recently, is now giving way to systems consisting of single cuts over a third, or even as little as one-quarter, of the circumference. It is now fully appreciated that the " bark is the mother of rubber," and that ample time must be allowed for bark renewal. Indeed, some of the areas planted 12 to 15 years ago, and drastically tapped, were so badly affected that they have been cut down and entirely replanted. Many points of detail in connection with tapping (number of cuts, height, breadth, angle, tapping interval, seasonal variations, &c.) have been studied, but it is remarkable that the true function of the latex in the tree is still a matter of controversy, nor is it at all certain how the rubber, chemically, is formed. Dubosc and Luttringer have suggested that inositol (derived from starch or cellulose) may be regarded as the starting point, the next stage involving the formation of methyl-butadienes, and Harries has formulated the theory that caoutchouc is formed by the condensation of C_5H_8 nuclei in *statu nascendi* as a result of the reduction of sugars or of pentoses.

Coagulation and Preparation of Rubber

Very little change is to be noted as regards the methods of coagulation employed on the plantation ; the acetic-acid process is still used in the preparation of the bulk of cultivated rubber. " Anaerobic " (natural) coagulation in closed vessels has been given a trial, and the results, so far as quality is concerned, have been satisfactory, but it is doubtful whether more than a very minute proportion of the whole output is made by all methods other than the treatment with acetic acid. Roughly 85 per cent. of plantation rubber is first grade, or, as it is officially termed, " first latex," and if we except a small quantity of thick (or " blanket ") pale crêpe, the form of this is invariably that of smoked sheet or pale crêpe.

" Smoked Sheet " and Pale Crepe Compared

At the best there is little to choose between these two classes of plantation rubber, but it is noteworthy that during the past few years pale crêpe has generally commanded a slight premium in price over its rival, notwithstanding the fact that the American manufacturer (who takes fully two-thirds of the world's rubber production) is inclined to favour the smoked sheet grade. For those not familiar with the subject, it may be stated that smoked sheet is prepared from coagulum, which is only lightly squeezed—and hence retains a considerable proportion of the serum solids other than rubber—and is subsequently dried in a smoke house in the presence of fumes generated by the dry-distillation of wood, coconut husks or similar material. " Latex " crêpe is obtained by relatively heavy machining (rolling) of the fresh coagulum on a mill of the rubber " washer " type, and the pale colour is the result mainly of treatment with sodium bisulphite. The best grades of smoked sheet are somewhat quicker curing and slightly stronger than the corresponding crêpe, but the " type " (see below) of the latter is slightly better. Against the advantages of the best sheet must be set the fact that, taken as a whole, it is distinctly more variable in quality than crêpe. The latter, in addition, can be used for certain grades of goods in which a light colour is essential, and its transport is somewhat more expensive than that of sheet.

" Slab " Rubber—" Maturation "

A novel grade, developed within recent times, mainly by Eaton and Grantham, of the F.M.S. Agricultural Department, is worthy of special mention, if it were only on account of the interesting scientific aspect of the matter. The nature of " variability " (see below) having been ascertained, Eaton and his collaborators set to work to discover the cause, and in a series of researches* have shown that the vulcanising capacity (*rate of cure*) of a rubber sulphur mixing is mainly dependent upon the presence of a natural accelerator or accelerators produced by the decomposition of the original serum proteins. This decomposition is brought about by bacterial (and/or fungoid) action. The ordinary process of making crêpe or sheet results in the elimination of the bulk of the serum-protein, with the result that the rubber is comparatively slow-curing. Eaton and his coworkers demonstrated that if the coagulum, instead of being machined or pressed soon after its formation (as is the case in the ordinary course of manufacture), is allowed to stand for several days, the necessary opportunity for breaking up the protein is afforded to the active microorganisms, and the result is a rubber which (under comparable conditions) will vulcanise correctly in, roughly, one-third of the normal time. The method of producing such fast-curing rubbers has been termed " maturation." After the necessary period has elapsed, the " slab "—as the matured coagulum is called—may be crêped in the usual way without materially affecting its activity. It has, further, been shown that the original serum also contains a vulcanisation catalyst, not in itself as active as the accelerator formed by decomposition, but present in sufficient quantity to produce—if the necessary measures are taken to prevent any elimination of it—a total catalytic effect equivalent to that obtained by maturation. The exact nature of the protein decomposition products found in the course of the latter process still remains to be determined.

Quality of " Matured " Rubber

De Vries† has come to the conclusion that the " slope " or " type " (see below) of matured rubber is distinctly better than that of normally prepared material, in figures, roughly as 34 to 37. The tensile strength, according to the same worker, is only slightly higher ; but Eaton‡—without, however, publishing any collated statistics—states that it is 20 to 25 per cent. greater. The writer of this article has examined a certain number of fast-curing rubbers, and, while confirming the views of de Vries as to the improvement in type, has also found that the strength is certainly above the average, but (so far as his experience goes) would feel inclined to estimate the increment at approximately 7 to 10 per cent. Nevertheless, " matured " rubber has not, so far, appeared in any quantity on the market, although it is believed that the rubber from some large American-owned plantation blocks (the produce from which passes direct to U.S. factories) is prepared on the lines first described by Eaton. The reason why matured rubber has, on the whole, made so little headway, is, in the writer's opinion, comparatively simple. Too much stress altogether has been laid on the importance of a naturally quick curing rubber, in view of the fact that the manufacturer has at his command not only the old and well-known accelerators, such as litharge, lime and magnesia, but also, nowadays, a whole host of organic catalysts (see below). Substantially all the vulcanisation research on the plantations has been carried out on rubber and sulphur mixings only,§ and the fact that what is relevant in this connection by no means applies to the vast majority of the ordinary mixings of commerce, has been largely overlooked. If matured rubber possesses no other advantage than that of quick curing, it is not likely (unless it can be produced more cheaply, which does not seem at all probable), in the writer's view, to displace any quantity of the present standard grades.

" Variability "

In the early days of the plantation industry numerous complaints as to the variable character of plantation rubber

* Dept. of Agricult., F.M.S., *Bull.* No. 27, 1918.

† " Archief v. d. Rubber Cultuur," 1918, 2, 213.

‡ *Loc. cit.*, 1917, 5, 185,377.

§ Quite correctly, in so far as the object is discrimination between different crude rubbers *per se*.

were voiced by manufacturers. As a result of an investigtion on the mechanical and physical character of the vulcanisation process by the writer and Goldsbrough,* and later by others,† it was shown that the trouble was mainly due to differences in vulcanising speed (rate of cure). For example, the writer found standard grades, such as smoked sheet and pale crêpe, varying (on his standard scale of speed) from 1½ to 4 hours. There were also marked differences in strength and "slope" or "type" (see below), but, so far as the manufacturers' immediate difficulties were concerned, the variation in vulcanising capacity constituted far and away the most important problem.

Measures to Reduce Variability

While at first the inclination was to look for the cause of variability in differences of the age of the trees, of soil and so on, the work of Eaton and others (see above) made it quite clear that these were minor factors, and that the true remedy lay in standardising the methods of collection, coagulation and factory handling. At the present time the bulk of the plantations employ substantially standard methods as regards anti-coagulants (sulphite of soda); bleaching agents (bisulphite); "bulking" (averaging by mixing batches of latex from different areas); dilution of latex prior to coagulation, strength and quantity of acetic acid employed in coagulation; length of rest period before machining, and methods of drying, packing and so on. Notwithstanding rigid standardisation, as indicated above, some variation—as might be expected from a consideration of the "maturation" problem—is still observable; but, on the whole, it is no longer of serious import to the intelligent manufacturer.

Other Crude Rubber Problems

The discovery of the nature and causes of variability has led to a flood of research and literature which, in the writer's view, is somewhat excessive, and has tended to obscure other important problems requiring elucidation. Thus it came, by some, apparently, to be believed that rapid curing and great strength were the only attributes of importance in the raw material; the fact that rubber is a typical colloid, and for a number of purposes is used for its specific colloidal qualities, has not received the attention it deserves. Thus for some purposes, *e.g.*, for certain spread and dipped goods, for such goods as insulation gloves, balloon fabrics, garments, ebonite, and so on, great purity and the capacity of forming an even, homogeneous film, of "breaking down" readily with a resultant low viscosity, and so on, are the essential and desirable features. Again, certain high grade wild rubbers, such as Brazilian "fine hard," yield "tackier" and stronger solutions for making joints in garments, &c., than does the plantation article. A number of other points might be enumerated regarding which research is desirable.

The Doncaster Research Laboratory

THE Doncaster Research (Mining) Laboratory is to be transferred to the Birmingham University. This announcement was made by Sir John Cadman, at the Annual Dinner of the Mining Society of the University of Birmingham on February 10. The laboratory which is concerned with research work in connection with the mining industry, is in charge of Dr. J. S. Haldane, who did valuable work for the Government during the war in the form of scientific research, particularly in regard to poison gas, and Dr. Haldane has been made an honorary professor and honorary director of research at the Birmingham University.

* Schidrowitz, "Variability," *The Rubber Industry*, 1914, 212, 219; and Schidrowitz and Goldsbrough and E. Hatschek and Goldsbrough, "The Rubber Stress-Strain Curve," *Jour. Soc. Chem. Ind.*, 1919, 347-352.

† Eaton, *loc. cit.*; de Vries and Spoon Archief, 1919, 3, 246; Van Rossem Diss, Amsterdam, 1916, &c., &c. (cf. Whitby, "Plantation Rubber." Longmans, Green, London, 1920).

Swiss Dyestuffs

To the Editor of THE CHEMICAL AGE.

SIR,—A statement has been made in the Press again recently intimating that supplies of German dyes are being exported to Great Britain and her Colonies as being of Swiss manufacture.

The Swiss dye manufacturing industry in Basle takes the strongest possible exception to this statement; and we enclose their detailed reply to these vague charges, from which it will be seen that the Swiss Government, in protection of its dyestuffs industry, is taking every step to prevent the possibility of German dyes being exported from Switzerland as dyes of Swiss manufacture with a view to obtaining any benefits that may be granted to the Swiss in return for their support to the industries of the world during the war. In fact, no German dyes can possibly be exported from Switzerland without a clear indication of their origin being shown.

We shall esteem it a favour if publicity can be given this statement through your news columns.—Yours, &c.,

Bradford, February 26. E. A. SWIFT.
(The Sandoz Chemical Co., Ltd.).

[COPY OF STATEMENT.]

We regret to see that it has been stated recently that many dyes of well-known German firms are imported into Canada via Switzerland, or that advanced raw materials of the same origin are sent to Switzerland and there converted into dyestuffs.

With regard to importation via Switzerland it should be known that dyestuffs are exported from Switzerland only under Government permit, this formality being insisted upon for protection of the bona fide Swiss dye-making industry. According to an official statement from the Swiss Government no permits for export to Canada or Australia have been granted by the Department concerned, during 1920, to any but the four undersigned Swiss dye-making firms.

We, the undersigned firms, desire to make the most emphatic denial of the assertion that German colours were or are being imported as Swiss ones. The products which we are sending are exclusively of our own manufacture, and not in one single instance can it be truthfully stated that dyestuffs of any other origin than purely Swiss have been exported by us to Great Britain and the Dominions since 1914. With equal emphasis do we deny that advanced German intermediates or half-finished German colours have entered into such manufacture.

We have developed during the war the manufacture of our own intermediates and have strictly adhered to the policy under which we came in 1915 to the agreement with the British Board of Trade for exchanging the supply of elemental raw materials in return for the equivalent deliveries to Britain of the dyes manufactured therefrom.

Finally, we wish to assure our friends in Canada, Australia and throughout the world, that, owing to our long manufacturing experience and our knowledge of the world's requirements, gained under the stress of adverse conditions during the years 1914 to 1919, when the dye consumers of the whole world turned to Switzerland chiefly for the supplies to meet their needs, we have proved that our claim for equal standing as manufacturers with any other source of supply is completely justified.

SOCIETY OF CHEMICAL INDUSTRY IN BASLE (sig. Ed. Ziegler, sig. Brodbeck); J. R. GEIGY, S.A. (sig. Ch. Geigy); DURAND & HUGIENIN, Société Anonyme (sig. Ch. Schreiner); CHEMICAL WORKS, formerly SANDOZ (sig. Stauffacher).

Basle, February 11, 1921.

The letter is also accompanied by the following declaration by the Department Suisse de L'Economie Publique, Section pour l'Exportation, dated Berne, January 27th: "Referring to your inquiry of January 25th, we herewith beg to declare that apart from the permits granted to the four Basle colour works for goods of their own production, no export permits have been given for colours of Swiss or foreign origin for Canada and Australia. Consequently also no export permits have been given for German goods to the above-mentioned countries."

Sir WILLIAM J. POPE has been elected Membre d'Honneur of the French Chemical Society.

Reviews

RUBBER, RESINS, PAINTS AND VARNISHES. By R. S. Morrell and A. de Waele. London: Baillière, Tindall & Cox. 1920. Pp. 236. 12s. 6d. net.

This little volume is one of a series on "Industrial Chemistry," under the general editorship of Dr. S. Rideal, who is the writer of the section dealing with rubber. The remainder of the work, by the authors named above, constitutes a brief but lucid and illuminating summary of the properties of paints and varnishes, together with those of their components, and of the general principles underlying their manufacture. In view of the fact that linoleum, paints, and varnishes have much in common, a useful chapter on the linoleum industry has been added. The reviewer is of opinion that Messrs. Morrell and de Waele have accomplished a by no means easy task in a thoroughly workmanlike and satisfactory manner. P. S.

COMPARATIVE THERM TABLES. By H. R. Askew. London: Benn Brothers, Ltd. 5s. net.

Mr. Askew's book is essentially one for the use of those in the administrative departments of gas undertakings. The majority of gas consumers are beginning to appreciate that the old volume basis of purchasing this commodity is shortly to give way to a system, whereby towns' gas is to be sold in "therms," each one of which represents 100,000 British thermal units. A certain amount of mathematical juggling is involved in finding out such things as what the price of gas per therm should be, and how the dividend fluctuates in accordance with this price. For those, therefore, who are weak at figures the author's ready reckoner will prove an invaluable time saver. The book, of course, appeals to a limited field, but it certainly should be of interest to large consumers of gas as well as to the actual producers. A. M.

AN INTRODUCTION TO THE CHEMISTRY OF PLANT PRODUCTS. Vol. I. On the nature and significance of the common organic compounds of plants. By P. Haas and T. G. Hill. (Third Edition.) London: Longmans, Green & Co., 1921. Pp. 414. 16s.

The necessity for a third edition, itself convincing evidence of the high position which has been taken by this well-known work, has led the authors to extend its scope in order to include more purely physiological problems. Accordingly the work is now to appear in two volumes, the first of which, now published, is mainly chemical and contains most of the subject matter of the older editions. The second will deal chiefly with the physiological side of the question, and will largely consist of new matter, but will include some of the problems, such as photosynthesis, previously discussed in the original work. This new volume will be eagerly awaited by biochemists, and should prove of great interest and value.

The present volume which has been brought up to date, and to some extent rewritten, presents an account of vegetable chemistry which is, on the whole, adequate, and is particularly valuable for its specific information about the occurrence and physiological importance of the various compounds described. Only in one or two places, such as the accounts of the heat coagulation of albumins, and of catalase, has any lack of precision been noticed. The only criticisms we would offer are that, as is perhaps almost inevitable, much of the information has the air of having been derived from reading rather than from experience, and that the book would probably have been even more welcome to students had the authors been less encyclopædic and more critical in their treatment. A. HARDEN.

A TEXT-BOOK OF INORGANIC CHEMISTRY FOR UNIVERSITY STUDENTS. By J. R. Partington. London: Macmillan & Co., Ltd. 1921. Pp. 1062. 25s. net.

This treatise, which is intended to serve both as an advanced text-book, and as a work of reference, deals comprehensively with the whole domain of inorganic chemistry, and contains very readable chapters on solutions and the phase rule, electrolysis, the inactive and radio-active elements and the structure of the atom. The opening sections of the work are devoted to a consideration of the composition of air and water, the properties of oxygen, hydrogen, water, common salt, chlorine &c., and the fundamental laws of chemistry. The older theories of valency are discussed in Chapter XIV., but the co-ordination theory might, with considerable advantage, have been introduced at a much earlier stage than the penultimate chapter. A brief introduction to the views of Alfred (not Alphonse) Werner on the structure of co-ordinated substances would have helped to explain the apparent anomalies of the principle of isomorphiom (p. 448), and the constitution of such compounds as HBF_4, H_2SiF_6, the isomeric hydrates of chromic chloride and sulphate, and nickel carbonyl, $Ni(CO)_4$ dubiously formulated on p. 973. References to physical properties are numerous, and add considerably to the value of the treatise. In the description of methods for determining vapour densities mention might have been made of the useful modification due to Lumsden.

Following on an exposition of the periodic classification in Chaper XXV., the remaining elements are considered mainly in their natural families, an arrangement which facilitates greatly the task of studying their properties comparatively. Very few errors are noticeable: acetonylacetone (p. 254) should be acetylacetone, and Naples yellow (p. 925) is more often employed to designate the pigment, lead metantimonate, than as a synonym for lead oxychloride. These slips are, however, minor blemishes in a work which may be recommended with confidence as an authoritative manual of general and inorganic chemistry. G. T. M.

THE FUNDAMENTAL PROCESSES OF DYE CHEMISTRY. By Dr. H. E. Fierz-David; translated by F. A. Mason, M.A., Ph.D. London: J. & A. Churchill, 1921. Pp. 240. 21s.

The work under review is intended for the student of what is termed dye or colour chemistry, that is, the chemical processes involved in the production of dyes. For these substances are not formed directly from the raw materials obtained from coal-tar; but the latter have to undergo a number, sometimes a large number, of intermediate operations with the production of so-called "intermediates." Their manufacture demands not only an intimate knowledge of organic chemistry and ordinary laboratory practice, but something more. For it is obvious that the ordinary laboratory apparatus, which is used in preliminary trials of the method, is not adapted for operations on a larger scale. So the process must be tested in miniature with such apparatus as may be subsequently magnified for large scale production. The object of the author is, therefore, to instruct the student of colour chemistry in the ways of the colour technologist. As he points out, "too much stress cannot be laid on the fact that the materials of which the apparatus is constructed play an important part in every process." We thus find figured in the text, photographs of such things as large and small jacketed and unjacketed autoclaves of different types, jacketed nitrating and sulphonating pans, vacuum pumps, vacuum distilling plant and vacuum filters—in short, the equipment of a colour technologist's laboratory and works.

The book is divided into four sections, dealing with intermediates, dyes, technical details and, finally, a section on analytical methods for testing the products. It is thoroughly practical, numerous examples being given in detail of the most modern processes used in the production of typical dyes and intermediates. There is no other book in English, we believe, of quite the same character, wherein the fundamentals of theory and works practice are combined, and we have little doubt that among the rising generation of young colour chemists it will serve as an invaluable guide. The English translation, so far as one can judge by a comparison of certain sections with the original German edition, is very much better done than most books of this kind. We have noticed a few mistakes in the formulæ on pages 30, 52, 62, 157, 159 and 175, which should be corrected in a new edition. J. B. C.

In the letter from Professor H. E. Armstrong, published in our issue of February 19, the words: "the admirable thesis" (p. 215) should have read: "the admirable first thesis" and in the last paragraph "Orange Book" should have been "Orange Back."

Patent Law and Chemical Research

Experimental Data and Theory

ON February 28, Mr. Harold E. Potts, M.Sc., delivered a lecture on "Accuracy of Experimental Data and Theory in Patent Specifications: The Experimental Problem." The lecture was the fourth of the series being delivered by Mr. Potts before the Liverpool Section of the British Association of Chemists, and was given in the Lecture Theatre of the Chemical Department of the University of Liverpool, Dr. H. A. Auden presiding.

Care in Description

Mr. Potts said the difficulty of prediction in chemistry was so great that a novel reaction applied, for example, to a primary amine, might not give any result at all when applied to homologues, and yet it was necessary to extend the scope of protection to other amines if possible. As the law heavily penalised any failure to comply with the conditions of accuracy, it would be appreciated that the problem of describing a chemical invention called for unusual care.

In patents for machines, he thought the present system was fair enough, because, if a man really wished to make an honest disclosure of his invention, he could usually give enough information on which to base an adequate specification. But it might be argued that the present British law was too severe in chemical cases, in which, with the best will in the world, it was difficult to avoid making a mistake somewhere, and it was significant that in chemical cases, the leading ground of attack on validity was usually that the specification was bad for insufficiency of description. The dangers he should discuss could be best overcome if the patent agent were prepared to make himself familiar with the chemical aspect of the invention in all its details, and if the chemist was prepared to co-operate by studying the problem out, and, if necessary, making some special experiments for the purpose.

Types of Insufficiency

The chief types of insufficiency and inaccuracy Mr. Potts said, were five: (1) Insufficiency in the sense of inadequacy, (2) inaccuracy in working directions or in data, (3) erroneous statements as to the advantages obtained by the invention, (4) mistakes in theory and (5) inclusion of inoperative examples; that is, examples which will not give a result. Thus, if he stated that the invention related to a new process of oxidising xylenes, and gave para xylene as an example, the patent would be invalid, if he claimed all the xylenes and it were proved that ortho-xylene gave no result. This was the cardinal difficulty since we met it at every turn when we attempted to generalise the invention, and to secure the widest protection possible.

The Court would usually only hold these errors fatal if they tended to mislead, or if they involved false suggestion.

The patentee was to be judged by the state of knowledge at the dates of the patent, and he would not be penalised by difficulties which only arose at a later date. The utility of the patent was not to be judged in the light of the advance which had occurred since the date of the invention, an advance which might be due to the efforts of the patentee himself. In Badische v. Levinstein, the dye made by coupling diazo compounds with naphthols according to the patentees' directions, were far inferior to those subsequently made and sold, but this fact did not make his patent bad. He (the lecturer) concluded that the specification must contain an adequate and accurate disclosure of the invention, and that everything claimed by the patentee must give some substantial result though not the best commercial result.

Possibilities of Failure

Speaking of possibilities of failure, the lecturer first considered insufficiency. As an example, he took the Normann patent of 1903 for hardening fats by hydrogenation in the presence of nickels. The patent referred to the work of Sabatier and Senderens on the hydrogenation of hydrocarbons by passing the vapour mixed with hydrogen over a catalytic metal such as nickel, and stated that it had been discovered that unsaturated fatty acids or glycerides could be easily hydrogenated by this method. It added that fat or fatty acids could be used in the liquid condition. The working directions were: "If fine nickel powder obtained by reduction in hydrogen is added to chemically pure oleic acid, then the latter heated over an oil bath, and a strong current of hydrogen is caused to pass through it for a sufficient length of time; the oleic acid may be completely converted into stearic acids. The quantity of the nickel thus added and the temperature are immaterial, and will only affect the duration of the process." The Court had to decide whether, in 1903, a skilled chemist could have hydrogenated oleic acids by following those directions without the necessity of further invention. It would be seen that this was a decision which could only be given upon evidence by skilled chemists.

The judge stated: "I come to the conclusion upon the evidence that Normann's process will not produce the result he claims for it unless the fine nickel powder is obtained in a special manner not indicated by the specification, or unless a very strong current of hydrogen is used, and mechanical stirring or some other special device is resorted to." He added: "To say that a direction to pass a strong current of hydrogen through a mixture of fine nickel powder and oleic acid in order to expose the acid to the action of hydrogen and the catalytic substance connotes the resort to every device known to science for making the exposure as complete or as frequent as possible, seems to me extravagant." The patent was therefore held to be invalid from insufficiency, since, though Normann had made a most important discovery, he had not given the public any practical means of taking advantage of it.

Errors in Theory

The specification might contain errors in theory. These were fortunately, not so serious, except in so far as they might lead the patentee to claim the wrong thing. But in themselves, errors in theory do not invalidate a patent, providing the invention is described so that practical results can be obtained in accordance with the statements of the patentee. On the other hand, if the error in theory leads the public astray in practice, it may be fatal.

Fourthly, the patent might contain errors with regard to the results obtained by the patented process. Usually, an inventor desired to set forth in the specification the advantages he obtained by his invention. This was not usually required by the law unless the advantages actually served to define the scope of the invention. If a process be accurately described and its application merely indicated, the Court would consider whether, and what advantages it possessed, by the aid of expert evidence. But if the patentee inserted laudatory and inaccurate statements of the alleged advantages be obtained, he might invalidate his patent.

Unworkable Reagents

Then there was the danger that the patent might claim a class of chemical individual as reagents, and that although the examples he specified might work, some of the members of the unspecified members of the class would not work. Suppose the patent claimed alkaline substances broadly, and gave caustic soda and lime as examples; if it were shown that potash or baryta were useless, such a claim would be invalid. This was one of the greatest difficulties experienced in chemical patenting, especially in dyes and drugs, where it was so difficult to predict whether any results could be obtained with the homologues or derivatives of any given reagent which had proved successful. The problem overlapped that of providing against the dangers of insufficiency.

In conclusion, Mr. Potts said that what he wished to make clear was, that the difficult problems raised could only be satisfactorily solved if there were the fullest co-operation between the patent agent and the chemist.

Discussion

Dr. F. W. KAY said that the patentee had only nine months in which to carry out research. The patent spoilers had over 14 years in which to carry out researches to find out accidental or problematical weak points. Was there, he asked, any way of avoiding that?

Mr. POTTS: No, it was a hardship, but it must be remembered that the Courts did exercise, or attempted to exercise, a measure of common-sense. A patentee was not required to show that he could obtain competitive commercial results.

Dr. AUDEN asked whether it was possible to protect the shape of a thing in which it was sold? There was a possibility of briquetting coming in and there was the question of crystallising. If one made a thing more marketable, was it possible to protect oneself in that?

Mr. POTTS: The Courts in the United States of America were much more liberal as to what constituted an invention. It had been held that a firm could protect a blue stripe on an automobile. In the United States they could obtain very wide protection for any idea of the kind, such as putting up tobacco in a particular way or in cartons. He thought that if one were to put it up in this country in any really new form one could get protection.

Mr. A. MEVINCK asked how far it was possible to get a patent for someone else's discovery.

Mr. POTTS: In Norman's case, the Court held that the reaction would not be effected in the liquid phase. The Court held in 1903 that it could not have been predicted by chemists that the catalytic reaction which was successful in the solid phase would be successful in the liquid phase. They would probably have concluded that it would have failed in the liquid phase. Chemists of 1903 would have considered unanimously, as the Court held, that it would have been fatal to any catalyst to be allowed to come into contact with the liquid phase. It was on the assumption that the chemists in 1903 would not have known that catalysis would have taken place in the liquid phase.

Catalysis in Industrial Chemistry

Processes of Hydrogenation

IN the third and final lecture at the Royal Society of Arts on February 28, on the "Applications of Catalysis to Industrial Chemistry," Dr. Eric K. Rideal discussed processes of hydrogenation.

The recent growth in the demand for hydrogen in industry, such as for filling rigid airships, for the synthesis of ammonia, the hardening of oils and in the fine chemical industry, said the lecturer, had stimulated research in the problem of hydrogen manufacture. Theoretically it should be more economical to manufacture hydrogen than blue water gas, but this had not yet been achieved. The catalytic manufacture of hydrogen from water gas first suggested by Mond and Langer had now passed the experimental stage and was in operation in those cases where hydrogen was required on a large scale and where the presence of small quantities of inert gases such as nitrogen was not objected to.

The method consisted essentially in the utilisation of a catalyst, usually oxide of iron, admixed with suitable promoters such as chromium oxide to attain equilibrium at relatively high space velocities in the water-gas reaction $CO+H_2O \rightleftarrows CO_2+H_2$. Water gas admixed with steam was passed through the catalytic material at a temperature of from 550°C. to 600°C. The effluent gas was purified by removal of the steam by condensation, the carbon dioxide by pressure scrubbing with water and the 2 per cent. of carbon monoxide either by pressure scrubbing with cuprous ammonium carbonate solution or by the process of fractional combustion. A catalyst operating with blue water gas at 400°C. instead of 550°C. was urgently required for this process to attain popularity.

The Bergius Process

The Bergius process of hydrogen manufacture attempted to effect the water production and water-gas reaction in one stage and at a temperature as low as 300°C. Coke is heated with water to this temperature in autoclaves. The critical pressure of the water at this temperature is 89 atmospheres, and this pressure must naturally be maintained during the reaction. Thallium salts and chloride are found to exert a markedly catalytic action.

Hydrogen from Coke

The primary reaction expressed by the equation

$$C+H_2O=CO+H_2$$

would probably be very markedly accelerated by fine grinding of the coke to ensure a more extended surface. A charge of 12 kg. of coke and 24 kg. of water should yield approximately 1,600 cubic ft. of hydrogen, and to do this the autoclave would require a capacity of only 1·5 cubic ft. The ultimate solution of the problem of hydrogen manufacture from coke would, said the lecturer, probably be found in some direct process such as this. The utilisation of hydrogen for the manufacture of hexahydrobenzene was a possible development in the gas industry, and the reverse reaction, viz., dehydrogenation of the saturated ring compounds, was a normal process occurring during the retorting of coal.

The hydrogenation of the unsaturated glycerides of the higher acids for the formation of semi-solid lard and solid butter substitutes was now a well-established industry. As catalytic material, nickel was now almost universally employed. Hydrogenation was effected in vessels in which the oil was maintained at a suitable temperature, 180 to 280°C.; the nickel was distributed throughout the body of the oil in a fine state of subdivision, whilst agitation was ensured by means of paddles or with the hydrogen itself. The utilisation of pressure was becoming more frequent. The crux of the problem of the hydrogenation of oils rests with the preparation of the catalyst. The fractional precipitation of the carbonate, followed by a reduction at a low temperature in a current of hydrogen, was usually employed. High temperatures caused the oil to acquire objectionable odours and taste, as well as colour, and a highly active catalyst was therefore desirable.

Active catalysts, however, were somewhat sensitive to poisons, and such sulphur compounds in the hydrogen and in certain oils, such as soya bean oils, were most deleterious. Carbon monoxide was preferentially absorbed by the nickel, and a higher temperature of operation was consequently required. The use of promoter catalysts—*e.g.*, nickel and copper or silver—was now becoming more frequent, but disagreement existed as to the optimum size of the nickel in suspension in the oil. Lessing achieved atomic distribution by the decomposition of the fat soluble unstable nickel carbonyl. Reduction of a fat soluble nickel salt in a peptising medium likewise produced an active and finely divided catalyst.

On the other hand, fine catalysts produced by direct reduction of nickel carbonate were not so active as relatively coarse catalysts presumably containing a core of unreduced oxide. Superficial oxidation and adsorption of gases requiring a relatively high temperature for desorption and reduction probably accounted for many discrepancies. During the hydrogenation of an oil by products such as the lower aldehydes, alcohols and acids were formed which might be preferentially absorbed and lower the activity of the nickel.

Synthesis of Ammonia

The synthesis of ammonia by the process of le Chatelier and Haber must be considered as a triumph of applied physical chemistry. An experimental and theoretical investigation of the reversible reaction $N_2+3H_2=2NH_3$ indicated that low temperatures and high pressures were essential to the production of ammonia in even reasonable quantities. The Badische Co. had developed the process, utilising a pressure of 100 to 150 atmospheres; whilst Elande had increased the pressure to 1,000 atmospheres on a small scale and 500 on a relatively large scale. As catalytic materials it had been found that both uranium nitride, prepared from the carbide, and osmium were most active; but the former was too sensitive to catalytic poisons and the latter too expensive for industrial use. As a technical catalyst was usually employed admixed frequently with small quantities of promoters, such as molybdenum, which was employed in England, or alkalies, as used by the Badische Co. in Germany. A circulating process was employed, the ammonia being renewed in each cycle by absorption in water, and the necessary amount of nitrogen and hydrogen pumped in to make up for the deficit. The technical problems which had to be solved in the design of machines to deal with gases at such high temperatures as 550°C. were extraordinarily difficult, and in the earlier plants explosions were by no means infrequent.

Ester Hydrolysis with Acids

Catalysts also found application in other branches of applied chemistry in addition to the methods of oxidation and reduction. The problem of ester hydrolysis with acids as the catalytic agent was one of them. The Twitchell process for the saponification of fats was a remarkable exemplification of the principle of molecular orientation. In this reaction the sulphonic acids of an aromatic or alphatic hydrocarbon were used as the catalytic agent. The non-polar hydrocarbon grouping dissolved in the fat whilst the polar sulphonic group was soluble in the water. Hydrolysis of ethylene in alcohol and dehydration of alcohol to ether were other typical examples of the utility of catalytic agents. Again, in the polymerisation of isoprene to rubber and in the vulcanisation of rubber goods the importance of catalytic methods had been well exemplified.

Chemical Industries of Norway

Condition of Nitrate and Carbide Works

A COMPREHENSIVE report of the industrial and economic situation of Norway in December, 1920, has been compiled by Mr. C. L. Paus, Commercial Secretary to H.M. Legation, Christiania, and published by the Department of Overseas Trade (Cmd. 1,145, 9d.). German exporters, it is stated, appear at present to be in a position to undersell all competitors, and at the same time to offer quicker delivery of drugs, chemicals, manufactures of non-ferrous metals, &c. Norwegian importers, however, often hesitate to place their orders in Germany, owing to a feeling of uncertainty as to her policy in dealing with exports and her internal condition generally, and because with the Mark at its present low value, a very small variation in the change might completely upset their calculations.

The market for heavy chemicals is reported to be nervous and uncertain, with a complete absence of demand, owing to the fact that the pulp and paper mills hold large stocks and that the latter are working short time. It is stated that considerable imports have taken place from the United States of America, and that, at the present moment, German firms are depressing an already glutted market with cheap offers. It is considered that the prospects of future trade for British exporters depend largely upon their ability to face American competition.

Nitrate and Carbide Works

While nearly all branches of industry are operating on a reduced scale, the few exceptions include the nitrate factories controlled by Norsk Hydro Elektrisk Kvælstofaktieselskab and the Cellulose and Mechanical Pulp Mills. The former are reported to have been fully occupied throughout the year and to have sold their production for several months ahead; it is not, however, anticipated that prices will maintain their present level. The latter are still working at their full capacity, partly in execution of old orders, and partly for stock; some of the mechanical pulp mills are, however, hampered by shortage of water. On the other hand, operations are more or less restricted in the mining electrochemical, electrometallurgical and oil-hardening industries. All branches of Norwegian industry are more or less dependent on imported materials—*e.g.*, fuel, rosin, chemicals, wool and cotton, iron and steel, metals, lubricants, &c.—which in most cases have to be purchased from countries whose currency is at a premium.

The carbide industry is dependent upon supplies of imported anthracite, which have been both difficult to procure and expensive. Further, both the carbide and the ferro-silicon factories have to face a greatly augmented capacity for production on the part of the rest of the world as well as competition from stocks accumulated in various countries during the war. Germany, formerly a good customer, has so increased her own production as to be independent of imports. Two of the Norwegian carbide factories (one of them erected during the war) have, therefore, closed down completely, a third, also erected during the war, has never commenced production, and the remainder are working at not more than 30 to 40 per cent. of their capacity, while the operations of factories producing ferro-silicon are still more restricted.

In the case of the electrometallurgical industry, the demand for aluminium and refined zinc, which is reported to have been good during the early part of the year, has now fallen off, owing, it is stated, in the case of the former, to depression in the British and American automobile industry, and, in the case of the latter, to over-production. The zinc refineries are said to have used large quantities of German shell fuses as raw material.

Mining and Fuel

The mining industry has been hampered by expensive labour and fuel and high rates of freight, as well as by the difficulty which Germany experiences in making payment. In the case of the pyrites mines, operations are much restricted, a number of mines having closed down altogether, and prices realised are unsatisfactory. The mines producing cupreous pyrites find themselves in a particularly unfavourable position, as with copper at its present price, it does not pay to extract the copper from the Norwegian ore, while for use in the chemical industry, cupreous pyrites is at a disadvantage as compared with non-cupreous, and the position thus arises that copper in the pyrites is regarded as an impurity lowering it in value. No production has, therefore, been possible in the Norwegian copper-smelting works this year, and it is considered improbable that smelting can be resumed, with present costs of production, until the price of standard copper rises to the equivalent of Kr. 2·70 per kilogramme.

The nickel ore mines and nickel refineries are now closed down completely (exports of nickel up to the end of September amounted to only 11 tons) and the chrome-ore and molybdenite mines have remained closed throughout the year. The production of the oil-hardening factories is much reduced owing to the difficulty of the Central Powers in financing purchases.

The production of soap, linseed oil and cocoanut oil appears still to continue on normal lines. Soapmakers have done a good trade, being practically independent of imported oils, and thus in a position to undersell foreign manufacturers. It is reported, however, that dealers are now well stocked and indisposed to make further purchases. In the case of the oil mills, it is stated that sales are at present small, as buyers anticipate a still greater fall in prices, but that some of the mills have still good contracts running.

Owing to the difficulty of obtaining sufficient supplies of coal from Great Britain, imports from the United States have this year increased very considerably. It is reported that the quality of British coals has deteriorated considerably of recent years, and that American coals, such as Fairmont and Pocohontas, have not infrequently been preferred to best Northumberland. On the other hand, it is stated that American coals are liable to spontaneous combustion, so that fires have frequently broken out on vessels carrying them, and that importers are much dissatisfied with American business methods.

American Coal Tar Products

Progress of the Industry

THE U.S. Tariff Commission has prepared a census report on the coal-tar industries of the United States which gives a survey of the domestic dye and coal-tar chemical industry in 1919, and presents the results of a special investigation made by the Commission. One of the outstanding developments during 1919 was the increase of 17·2 per cent. in the productive capacity of by-product coke ovens in the United States. The output of coke in by-product ovens was 56·2 per cent. of the total production, and thus, for the first time, exceeded the output of the wasteful beehive ovens. In 1919 considerable progress was made as to supplies of anthracene, the output of this important material being about three times the production of 1918; moreover, a larger proportion of it was refined. It might be roughly estimated that the 1919 production contained about one-fifth the amount of pure anthracene required for American needs. When a sufficient supply of anthracene was secured, an adequate production of alizarin and vat dyes would soon follow.

The fundamental difficulty, continues the report, is not primarily an actual lack of anthracene in the tar, nor are there purely technical difficulties in its recovery, but, rather, the fact that its removal leaves the pitch so hard that it does not find a ready market in the country. Any method of recovering anthracene which seriously disturbs the marketing of other larger fractions of the tar, especially the pitch, would make the anthracene so expensive that the dyes derived therefrom could not be made on a competitive basis. In England and Germany large amounts of hard pitch were used for the briquetting of coal dust and coke breeze, but this industry is little developed in the United States. England shipped considerable amounts of crude anthracene to Germany before the war.

The securing of supplies of anthracene adequate in amount and at a cost which is not prohibitive is perhaps the greatest difficulty confronting the industry. Whether the problem will be solved by the tar distillers or by the development of a synthetic process for making anthraquinone from raw materials now available in adequate quantity cannot be determined at the present time. Active work along both lines is being done, and important progress has been made during 1920. Production of carbazol was reported in 1919 by one firm. It is obtained as a joint product in the separation of anthracene from coal tar. The development of a demand for carbazol would facilitate an increase in the production of anthracene from coal tar.

False Ideas That Damage Industry

By Ernest J. P. Benn

IN the industrial sphere there are three current false assumptions which are between them chiefly responsible for our industrial troubles. The first is that any benefit can come from war. Millions of our young men were encouraged to fight, and millions of those who remained at home were encouraged to buy war stock, and in both cases part of the inducement was a subtle suggestion that material benefit would follow victory. This is recoiling upon us with tremendous force to-day. Everyone who is under the impression that he is entitled to something he does not possess, is inclined to argue that having done his share towards winning the war he has a right to claim this, that, or the other. The cold fact is that warfare is a synonym for impoverishment, for both victor and vanquished. We fought to save our country from the domination of Kaiserism; nobody doubts that the sacrifice was necessary, or that it was amply worth while, but it is damaging and malicious to suggest that that necessary sacrifice can in any way add to the wealth or the material comfort of any section of the community. It will be necessary to relieve the mind of the working classes of this political illusion before they will be willing to put their hands and brains and heart into the heavy work of repairing the damage of five years of Armageddon.

Organisation no Substitute for Work

The next false idea is that organisation is a substitute for work. This has gripped the imagination of the public, and its evil consequences are to be traced throughout all our social arrangements. It is thought in Parliament that by setting up some Ministry, or passing some Act, the countryside can be sprinkled with "homes for heroes." It is commonly believed by merchants and employers that by observance of the rules of some trade association or the setting up or knocking down of some Government restriction wealth can be created. It is firmly held by the working classes that the membership of some union, the invention of some restrictive rule, or the observance of regulations as to limitation, will definitely add to their material well-being.

The effects of all this go deep and far; it is more powerful and dangerous because attached to it there is a thin veneer of truth. Organisation, whether by the Government, by trade association or by trade union, can facilitate the work of the individual, can open up opportunities for work, can add very materially to personal efficiency, and can in those ways contribute to personal wealth. But so far the arts of organization are not working in this direction. The truth is that organisation can never be a substitute for work, that a trade union may enable a man to get a proper share of the proceeds of work done, but can never make it possible for him to get a lasting return for refraining from work.

Wealth no Crime

The third mistaken idea is that wealth is a crime. The creaky workings of the industrial machine to-day are largely due to the common belief that the possession of wealth by individuals is an abuse which must be stopped. The Chancellor of the Exchequer, whatever his party, always plays up to this theory and panders for popularity by inventing new forms of taxation as a punishment for those who possess great wealth. The trade unions owe the bulk of their fighting strength to the successful way in which they have led their members to believe that wealth is only secured by robbing them. It is surely time that the other side of this case were given a hearing. The fact is that the possessors of wealth are so little aware of the part which they play in the well-being of the community as to be unable to state their case; but having regard to the experiences of the last few years, having regard in particular to the recent slump and the present unemployment, there is now great need for a campaign which shall have for its object the education of the public in the true position. The facts are, of course, that no material progress can take place without the creation of a big class of wealthy persons; and conversely that the existence of such a class is the surest guarantee of general prosperity.

There never was a time when the answer to the socialistic theory could be given with such force and such certainty of acceptance. The utter fallacy of the "sharing out" school can be proved from the mouths of its own exponents. Mr. Chamberlain is at this moment collecting a revenue which is larger than the whole of the incomes of everybody ten years ago. The State coffers into which the socialist would pour all wealth now contain sums which are beyond the most avaricious of the dreams of Mr. Sidney Webb or Sir Leo Chiozza Money as recently as ten years ago. But the possession of these huge sums by the Treasury has not produced the results which were promised. The case for capitalism and individualism never had such a wealth of illustration as it possesses in these times. It is false to say or to believe that wealth is a crime, and an adequate amount of effort and energy put now into the reverse proposition would turn public opinion into the opposite direction, and with it turn the efforts of all towards that creation of personal wealth which alone can bring the greatest benefit, not only to the wealthy, but to every member of the community.

German Dye Case Appeal

IN the Court of Appeal, before the Master of the Rolls and Lords Justices Warrington and Younger on February 22, the case of the Actiengesellschaft für Anilin Fabrication in Berlin and the Mersey Chemical Works, Ltd., v. Levinstein, Ltd., was heard, upon the appeal of the plaintiffs from the judgment of Mr. Justice Sargant in the Chancery Division dismissing the action.

Sir Arthur Colefax, K.C., opened the appeal. He said the judgment appealed for was dated February 24, 1914, and the present appeal was almost heard just before the outbreak of war, and had been standing over ever since. At the present moment the plaintiffs, the Mersey Chemical Works, were in liquidation, and he applied for the liquidator. The plaintiffs brought the action for the alleged infringement of a patent standing in the name of Abel, No. 1,151, of 1900, and the subject matter of the patent was for the "manufacture of a black colouring matter directly dyeing cotton." In the action the defendants had raised all the usual defences—viz., want of novelty, want of utility, insufficiency of plaintiffs' specification, and also non-infringement. Every issue in the case had been decided in the plaintiffs' favour except one, and that was the issue of infringement, and in respect of that all grounds except one had been decided in plaintiffs' favour and it was upon that one ground that the plaintiffs were appealing.

The learned Counsel then went with considerable detail into what the defendants' process was and what the defendants alleged differed from the plaintiffs' process in several respects, and particularly in the fact that in it dinitrophenol was not used, but that a sodium salt of that body was used. Plaintiffs' case was that the defendants' process was a colourable imitation of the plaintiffs' and that the processes were indistinguishable and were chemically identical.

At the resumed hearing on Monday Mr. Terrell, K.C., for the respondents, argued that the casella process, so far as dyemaking was concerned, was not a melting process but a boiling process, and therefore there was no subject matter for appellants' patent. If, however, the judge were held to be right in thinking there was just sufficient invention in the appellants' patent to give it subject matter, then it followed that the use of sodium salt in respondents' process gave it sufficient distinction from the plaintiffs' process to make it impossible to say there was any infringement. All the arguments which went to shew that there was subject matter, applied equally to show that there was no infringement, and there was authority for saying that such a difference as the use of the sodium compound sufficiently distinguished the respondents' process as to make it no infringement of the appellants' patent.

The further hearing was adjourned.

Patents Court Cases

Application has been made for the following patents to be indorsed "Licences of Right" under Section 24 of the Patents and Designs Acts, 1907 and 1919: 4219/1906 (J. Y. Johnson—Badische Anilin & Soda Fabrik) relating to the production of nitrites; and 130,966 (Norsk Hydro-Elektrisk Kvaelstofaktieselskab) relating to sulphuric acid containing nitrogen oxides. Any notice of objection must be given by April 4, 1921.

Lubricators and Lubrication

Use of Free Fatty Acids

At a well-attended meeting of the Newcastle Section held on February 23, Mr. L. Archbutt, F.I.C., chief ch mist of the Midland Railway, delivered an illustrated lecture on "Lubricators and Lubrication." The chair was taken by the local president, Dr. J. H. Paterson. There was no discussion, and the lecture will be followed by one on the same subject on March 10.

Mr. Archbutt said two entirely different conditions had to be considered in connection with the problems of lubrication, first the condition in which the solid surfaces became completely separated by a film of liquid oil which forced itself between them, and, secondly, the condition in which no such oil film could form and the solid surfaces came into close contact and rubbed against one another. In the first condition—liquid film lubrication—the friction depended upon the viscosity of the lubricant. Animal, vegetable and mineral oils of the same viscosity were equally efficient lubricants, and the mineral oils were preferred owing to their lower cost, greater inertness to atmospheric influences and freedom from properties which caused gumming and chemical attack upon the metallic surfaces. In the second condition, which might be termed solid film lubrication, the efficiency of the lubricant depended not upon its viscosity but upon another property which had been termed "oiliness."

That property was possessed in different degrees by different mineral oils, and in greater degrees by animal and vegetable oils than by mineral oils. It depended also in the case of each lubrication upon the nature of the surface with which the lubricant was in contact. Liquid film lubrication, obtained in cylindrical journals and in thrust bearings fitted with tilted thrust pads, was the condition always aimed at by engineers, because the friction was reduced to the lowest possible limit. Solid film lubrication obtained to a greater or lesser extent in plain thrust bearings not fitted with tilted pads, in gears, and wherever the conditions of low speed, high pressure and the shape of the surface were such that the liquid film could not form or could not form completely. Between surfaces lubricated by liquid film the co-efficient of friction $\frac{F}{W}$ was as low as 0·002 to 0·004, but between lubricated solid surfaces, rubbing in contact, it was very much higher, say, 0·1 to 0·3.

Comparative Tests

After describing the commoner types of oil-testing machines in use, Mr. Archbutt said the most useful tests were made at very low speeds. When Texas mineral oils first came on the market he made some tests with an improved machine the Midland Railway Co. had in comparison with the red engine oil from Pennsylvania crude, which they were using for locomotives. Tests were made at speeds of 7 ft., 70 ft. and 200 ft. per minute. The temperature of the room was maintained constant between 63°F. and 65°F. The load on the bearings was 385 lb. per square inch. Tin base white metal bearings were used. The oil was supplied from a tube containing a wick on the one side of the journal, and evenly distributed along the brass by the knitting needle. The quantity of oil supplied could be regulated by a valve in the tube, and the volume moved could be measured by maintaining the oil at a constant level in the tube by feeding oil from a burette. That was only done at one speed, 70 ft. per minute; the results observed were that at the lowest speed where the friction was partly viscous and partly contact Texas oil, though much higher in viscosity, did not give much higher friction than the Pennsylvania oil. At 70 ft. per minute the temperature rose higher with the Texas oil, and the viscosity fell to nearly the figure of the paraffin base oil. The frictions became more nearly alike. More of the Texas oil was required than of the paraffin base oil to keep the friction and temperature constant.

At 200 ft. per minute, the temperature was still higher with the Texas oil, and the viscosity was then rather lower. The friction co-efficients were the same within the limits of error. The net results showed that the Texas oil had the higher running temperature throughout—due perhaps to the lower specific heat of the oil—and gave rather higher friction. In oiliness, so far as one could judge from the tests, it compared favourably with other oil.

In liquid film or viscous lubrication, the films of lubrication between the friction surfaces were not more than a few thousandths of a millimetre thick. Thickness ranging from 5/1,000ths to 80/1,000ths of a millimetre had been measured. Such exceedingly thin films contained, however, in their thickness many hundreds of molecules, and possessed the very low internal friction and other properties of true fluids. Very much thinner films than those—films of such excessive tenuity that they could no longer be regarded as fluids—could nevertheless act as lubricants. He referred at length and in detail to much of the work of the late Lord Rayleigh, Langmuir, Harkins, the Hardys, and Professor W. H. Bragg on the theory that films of mono-molecular thickness could lubricate, and said that the importance of that theory in connection with lucrication and the problem of "oiliness" was obvious, especially as they knew that the best lubricants did contain in their molecules the "active groups" referred to by all the quoted observers, and which Langmuir held to be necessary to cause them to pack into the surface layers of the solids to be lubricated.

All the available evidence, continued Mr. Archbutt, went to show that oiliness depended upon a change in the condition of the solid surface caused by the contact with the lubricant, and on the presence in the lubricant of active molecules capable of effecting that change. A new surface film was formed of exceeding thinness, of the order of one-millionth of a millimetre, which was not a liquid, although the lubricant applied to the solid surface might be a liquid. The molecules of the new surface resisted displacement, but they opposed less resistance than the molecules of the unlubricated surfaces, and less heat was developed in the process.

Free Fatty Acids

He referred to the researches of Messrs. Wells and Southcombe (Society of Chemical Industry) on the importance of the free fatty acids in vegetable and animal oils. Free acids of any kind, he continued, in a lubricant for metallic surface had usually been regarded as a constituent to be avoided, and for very good reasons. In steam cylinders in lubricating greases containing water and even in lubricating oils containing no more moisture than that due to natural cause, fatty acids attacked metal surfaces, forming metallic soaps which obstructed steam passages and dissolved into and thickened the lubricant, besides damaging the surfaces themselves; but it had not been proved that fatty acids in very restricted amounts were an advantage and improved the lubricating value of mineral oils to the same extent as a larger quantity of fatty oil would do. His attention was drawn to the process of Messrs. Wells and Southcombe in September, 1919, and he made a long series of tests with a testing machine especially fitted for the purpose. By running the machine at a very low speed and with a heavy load on the bearings a certain amount of friction was obtained. The speed at the surface of the journal was seven feet per minute and the load about 270 lb. per square inch. A few preliminary tests were made with Wells' Tonicol containing about 25 per cent. of free fatty acid, and they showed at once that 2½ per cent. of Tonicol mixed with a mineral oil lowered the co-efficient of the friction to about the same extent as 10 per cent. of commercial rape oil.

After describing the results of tests with the Thurston, the Lanchester and the Deeley machines, he said they were all in agreement as to the value of free fatty acids. On the Midland Railway they were experimenting quite successfully up to the present on loco and carriage axles, and he was hopeful that they would be able to replace a large proportion of the fatty oil which they used for lubricating with a smaller proportion of fatty acid.

It seemed a great pity that animal and vegetable fats and oils, so essential for food, for the manufacture of soap and glycerine and for other purposes for which their chemical composition essentially fitted them, should be wasted in lubricating machinery, if the free fatty acids from a fraction of the quantity so used would answer the purpose. Not only so, but it would be a great advantage to get rid of lubricants which so readily thickened, gummed and developed free acids which corroded. He thought no trade interest should be opposed to that. Mineral oils would be used more extensively and fatty oils would be diverted into more useful channels. He did not think fatty acids would entirely replace glycerides for lubrication. There was good evidence that neutral glycerides had their uses in certain circumstances, but he felt fairly confident

that fatty acids would eventually replace the greater part of the glycerides now used for lubrication. A point on which he wished to be quite clear was that in liquid oil film lubricating free fatty acids, or glycerides for that matter, had no use beyond that due to their viscosity. The special value of the free fatty acid came in when friction occurred, *i.e.*, friction at low speeds and under high pressures, where the oil film could not completely form.

Natural Lubricants

A few minerals—mica, talc, soap stone and graphite—acted as natural lubricants. Langmuir found that the surface of freshly split mica (biotite) was as slippery as a glass surface lubricated with a film of oil. Graphite was by far the most important of solid lubricants. Natural graphite was found in the flake form and also amorphous, but the kind usually employed as a lubricant was the flake graphite. Amorphous graphite was made in an electric furnace, and by methods by Acheson obtained by him in a colloidal form and sold, mixed with water under the name of Aquadag or mixed with oil as Oildag.

In the lubrication of machinery solid lubricants were used either dry, mixed with grease or mixed with oil. On certain parts of lace-making machinery dry graphite was used as a lubricant to avoid staining the fabric with oil, also in chololate-making machinery to avoid getting oil into the chocolate. Graphite was used for high temperature machines and for the manufacture of tungsten and other processes requiring high temperatures, and, therefore, a non-combustible lubricant. He gave details of many tests carried out in connexion with graphite lubrication and said that on heavily loaded bearings and whenever the conditions were liable to cause heating, solid lubricants added to the oil had been found useful, and also in cases where lubrication was apt to be neglected. He quoted the results obtained by Mr. E. W. Johnston when running cylinders and valves without the use of oil as a lubricant, and remarked that that example of the lubrication of steam cylinders without oil was useful, but it was well known that vertical cylinders were easy to lubricate, and it had yet to be ascertained whether horizontal cylinders can be successfully lubricated in that way. Those remarks applied to cylinders lubricated with saturated steam. In the case of cylinders using superheated steam the surfaces were drier and more difficult to lubricate owing to the higher temperatures. Graphite had been used for such purposes mixed with cylinder oil with varying degrees of success.

Institute of Chemistry

Sir Herbert Jackson on the Year's Work

THE Forty-third Annual General Meeting of the Institute of Chemistry was held on March 1st, at the Institute's house, 30, Russell Square, London, W.C. 1.

Sir Herbert Jackson, the retiring President, in the course of his address remarked that Government departments and the authorities generally had shown more inclination in recent times than in the past to accord higher recognition to the services of men of science. The conditions of appointments of chemists, both in the Government service and in industry, had been improved and until the close of 1920 the profession had been in almost a unique position in that very few indeed of its members were disengaged. The prevailing depression in industry had had some effect on the employment of chemists, but even now less than 50 were disengaged out of nearly 3,300 on the roll.

The by-laws of the Institute had undergone revision to provide for the representation of chemists from various parts of the country and practising in different departments of work, and alterations had been made to define more specifically certain points relating to the ethics of the profession and further to restrict the membership of the Institute to British subjects.

The Institute was taking part in many matters affecting the public life of the country where chemistry was concerned, and the Annual Report showed that Chartered professional bodies of this character were able to render the State valuable service. The greater consideration given to science by the Government was an encouragement to the coming generation of chemists to follow a career of essential and vital importance to the needs of the country.

Maintaining Essential Industries

It would probably be regarded as desirable at the present moment for the Council of the Institute, without taking part in politics, to give expression to their views on the grave importance of maintaining in this country industries on which not only the future development of our chemical industry and many allied industries depends, but the future of a very large number of students' of chemistry who are now undergoing training.

The Institute was entrusted by its Charter with securing the supply of well-trained chemists, but unless a great chemical industry was maintained there would be a very poor prospect for them. The President maintained that the Institute had throughout its existence fulfilled the purposes for which it was incorporated.

It had kept alive the corporate spirit of the profession, the means whereby the opinions and views of its members found expression in matters of public concern. It was the officially recognised public body to whom the country could turn for advice and guidance on matters relating to the profession. It rendered every possible assistance to those who intended to follow the profession of chemistry and promoted and maintained the highest standard of training and competence for that profession. It registered the trained and competent and thereby supplied competent professional service for the country. Moreover, it promoted the strictest integrity on the part of its members in their dealings with one another and with the public, and fostered by every means in its power the status of the profession. He was confident that it would continue to gain strength and prestige.

The following Officers and Council were elected :—

PRESIDENT.—Alfred Chaston Chapman, F.R.S.

VICE-PRESIDENTS.—Horatio Ballantyne ; Ernest Mostyn Hawkins ; Sir Herbert Jackson, K.B.E., F.R.S. ; William Macnab, C.B.E. ; Gilbert Thomas Morgan, O.B.E., D.Sc. ; George Stubbs, C.B.E.

HON. TREASURER.—Edward William Voelcker.

MEMBERS OF COUNCIL.—Walter Ernest Adeney, D.Sc. ; William Bacon, B.Sc. ; Francis Howard Carr, C.B.E. ; Arthur Jenner Chapman ; Allin Cottrell, M.Sc. ; Alexander Charles Cumming, O.B.E., D.Sc. ; Frederick George Donnan, C.B.E., F.R.S. ; Lewis Eynon, B.Sc. ; Alexander Findlay, D.Sc., Ph.D. ; George Watson Gray ; Frank William Harbord, C.B.E. ; Charles Alexander Hill, B.Sc. ; Patrick Henry Kirkaldy ; Frederic Herbert Lees ; Samuel Ernest Melling ; Gordon Wickham Monier-Williams, O.B.E., Ph.D. ; Harold Moore, O.B.E., B.Sc. ; Andrew More ; Frederic Mollwo Perkin, C.B.E., Ph.D. ; Benjamin Dawson Porritt, M.Sc. ; Thomas Slater Price, O.B.E., D.Sc., Ph.D. ; William Rintoul, O.B.E. ; William Henry Roberts, M.Sc. ; John Rogers, O.B.E. ; Ernest Woodhouse Smith, D.Sc. ; Leonard Ellerton Vlies ; Sir James Walker, C.B.E., F.R.S.

Coal Tar Distillation

History of an Important Industry

AN interesting lecture on Coal Tar Distillation was delivered at the Manchester College of Technology on February 24.

The lecturer Mr. G. J. Denbigh M.Sc. A.I.C. of the Workington works of Brotherton & Co., Ltd., discussing the history of the coal tar distillation industry said that the industry really dated from about 1848-1850 largely as the result of Hofmann's research work at the Royal College of Science and of the growing appreciation of the value of creosote for pickling timber.

An English patent for the manufacture of tar and pitch from coal had been taken out as far back as about the middle of the seventeenth century, but at that time there was no great demand for the products. Mr. Denbigh described the well-known processes in operation at gas works and coke ovens and outlined the methods employed for the separation and purification of the oils and other products produced.

The development of the coal tar distillation industry was, he said, one of the finest examples of the valuable work of the chemist and the chemical engineer that could be found.

HARRISONS & CROSFIELD.—Dividends of 7½ per cent. on deferred ordinary shares, Nos. 1 to 182,966, and 5 per cent. on Nos. 182,967 to 189,936 ; 2.851d. per share on management shares, less tax, paid February 23.

The Institute of Metals

Election of Council Members

FOR the first time in the history of the Institute of Metals a contested election for vacancies occurring on the Council is taking place. The candidates are as follows: Mr. L. Archbutt (Derby), Mr. T. Bolton (London), Dr. W. H. Brownsdon, M.Sc. (Birmingham), Engineer Rear-Admiral R. B. Dixon, C.B. (London), Professor C. A. Edwards, D.Sc. (Swansea), Dr. R. S. Hutton (Sheffield), Mr. F. C. A. H. Lantsberry, M.Sc.Tech. (Sheffield), Dr. R. Seligman (London), Mr. F. Tomlinson (Manchester).

There are seven vacancies on the Council. Engineer Vice-Admiral Sir George Goodwin, K.C.B., LL.D., has again been nominated as president. The result of the ballot will be announced at the forthcoming annual general meeting of the Institute, which is to be held at the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1., on Wednesday and Thursday next. At that meeting there will also be declared the result of the ballot, which is taking place, simultaneously with the Council ballot, for the election of new members and students. The names incuded in the ballot are exceptionally numerous—42 members and 25 students—twice the number that were being balloted for at the corresponding meeting a year ago. This fact suggests that the depression of trade is not a factor which adversely influences the seeking after scientific and technical knowledge that can be obtained through association with our scientific societies. The membership of the Institute has now reached the highest point in its history, namely, 1,350, and membership applications are coming in quickly in readiness for the further ballot to be held on April 20. Particulars of the Institute, together with visitors' tickets for the forthcoming annual general meeting of the Institute, will be forwarded on application to the Secretary, Mr. G. Shaw Scott, M.Sc., The Institute of Metals, 36, Victoria-street, Westminster, S.W.1.

London Section

A London Local Section of the Institute of Metals has just been formed, with the sanction and financial assistance of the Council. The Chairman is Dr. O. F. Hudson, of the Admiralty Engineering Laboratory, and the Honorary Secretary is Mr. D. Hanson, M.Sc., of the National Physical Laboratory, Teddington. Membership is available to persons resident within fifty miles of the G.P.O. No subscription is required of Members of the Institute of Metals, but non-members of the parent body, when elected as Associate Members of the Local Section, pay an annual subscription of five shillings. The first paper to be brought before the London Section was that read on February 24th by Mr. O. W. Ellis, M.Sc., on "60 : 40 Brass." On March 31st Mr. S. L. Archbutt is to read a paper on "Aluminium Alloys," whilst on April 21st Dr. W. R. Ormandy will present a paper on "Refractories." The London Section already has a membership of over 200, and is proving a valuable meeting ground for metallurgists and engineers who wish to meet and discuss technical problems at more frequent intervals than is practicable in the case of the parent Institute. The success of the new Section, following as it does upon that of the other Local Sections of the Institute of Metals in Birmingham, Glasgow and Sheffield, is very gratifying to the Council, who, it is understood, anticipate that other Local Sections will shortly be formed in important metallurgical centres, *e.g.*, in Newcastle-on-Tyne and Swansea.

Designing a Still

AT the Bradford Technical College, last week, Professor J. W. Hinchley, of the Imperial College of Science and Technology, gave the final lecture of a series of three on "The Design of a Simple Still." In dealing with the metal construction of a still, the lecturer indicated how ordinary mechanical practice had to be modified for chemical purposes. One had to take into account the character of the metal, the character of the liquid and points relating to temperature and pressure. By means of a simple graphical method, which he demonstrated, one could obtain the mean temperature difference in plants and stills of considerable size where the temperature varied in different parts of the plant. Professor Hinchley demonstrated methods of separating liquids and explained the design of fractionating columns for that purpose.

British Industries Fair

Exhibits at the Glasgow Section

FROM all points of view the British Industries Fair which opened its doors in the Kelvin Hall of Industries, Glasgow, on Monday afternoon, is an enterprise upon the organising of which its promoters are to be highly complimented. The general display covers several important spheres of industry, and the special section devoted to chemicals is again receiving extensive support from exhibitors, although there are not quite so many firms exhibiting in this section as at last year's fair.

James G. Barr, Ltd., of Glasgow, show a wide range of industrial heavy chemicals such as caustic soda, bleaching powder, carbonate of ammonia, sulphate of ammonia, bauxite, and various acids; while Hickson & Partners, Ltd., of Castleford, have a large display of sulphuric acid, pure benzene, pure toluene, pure xylene, solvent naphtha, heavy naphtha, creosote oils, and many other important products.

Chemicals for all industries, including petroleum products, intermediates and raw materials for the dye and colour trades, acids of all kinds, alkali products, heavy chemicals, and oils, fats and waxes of various descriptions are to be seen at the stand of Charles Tennant & Co., Ltd., of Glasgow; and Perry & Hope, Ltd., of Nitshill, display sulphate of iron, soda, magnesia, carbonate of soda, phosphate of ammonia, phosphate of soda and phosphoric acid for sugar refiners and commercial purposes. In addition, this firm also shows various chemical preparations suitable for bakers and confectioners, grocers and provision merchants, chemists and druggists, and aerated water manufacturers.

John Poynter, Son & Macdonalds, of Glasgow, make an interesting show of their various manufactures of chemicals which include bone fat, tallow, glue, bone pitch and bone oil, sulphate of ammonia, carbonate of ammonia, yellow prussiate of soda, sulphate of zinc, and acids and chemicals of all descriptions for export purposes.

The exhibit of the Glasgow Corporation Chemical Works Department includes coal tar, refined tars, crude naphtha, light oil, carbolic oil, creosote oil and pitch; in addition to ammoniacal liquor, liquid ammonia, sulphate of ammonia and neutral sulphate of ammonia. John W. Leitch & Co., of Huddersfield, have an interesting collection of products representative of raw materials and intermediates for the manufacture of coal tar dyes, as well as the finished dyewares.

Failure of Mann & Cook

Petition Filed Last Week

THE *London Gazette* of Friday last published the following announcement under the heading "The Bankruptcy Act, 1914: Receiving Orders":—

MANN, William, "Greenbank," Camborne Road, Sutton, Surrey, MANN, Francis, 66, Turney Road, West Dulwich, London, and HOSEY, Joseph Patrick, 20, Bishop's Road, London, carrying on business as PRODUCE MERCHANTS, under the style of MANN & COOK, at 7, St. Michael's Alley, Cornhill, London, E.C., and also at 8, Chatham Street, Manchester; Royal Liver Buildings, Liverpool; 120, Broadway, New York; Via San Lorenza, No. 11 int., 20, Genoa; Oppert, 74, Rotterdam, and 247, George Street, Sydney, Australia.

Date of filing Petition—Feb. 23, 1921.

Date of Receiving Order—Feb. 23, 1921.

Whether Debtor's or Creditor's Petition.—Debtor's.

With reference to the firm of Mann & Cook (West Africa), Ltd., Mr. Robert J. Hilton, director, states in a letter to the press that Mann & Cook were the vendors in the formation of the West Africa company, and that the credit of the latter company is in no way affected. "Nearly 80,000 of the vendors' shares," he states "are now controlled by one of the five leading joint stock banks, and it is not intended to place these shares on the market."

Mr. William Mann, the senior member of the firm of Mann & Cook, has for some time held the post of President of the British Chemical Trade Association, and he was recently appointed the Association's representative to the London Chamber of Commerce.

From Week to Week

LORD MOULTON has been elected an honorary member of the Institution of Civil Engineers.

THE STYLE of the New Explosives Co., Ltd., has been changed to Necol Industrial Collodions, Ltd.

It is reported from Tsingtau that plant is likely to be required there for the EXTRACTION AND REFINING OF PEANUT OIL.

It is announced from Italy that the Voberasco di Cornigliano Ligure has resumed the production of SILICATE OF SODA.

Dating from February, 1921, 15 per cent. of the German monthly output of SULPHATE OF COPPER will be released for export.

PROFESSOR W. L. BRAGG, M.A. (Professor of Physics in the University of Manchester), has been elected a Fellow of the Royal Society.

At a recent meeting of the Academy of Science, Paris, the president announced the DEATH OF M. EMILE BOURQUELOT, member of the Section of Chemistry.

Messrs. CALDERS' CREOSOTING WORKS at Queen's Dock, Swansea, are absorbed by a new letting of land by the Harbour Trust to the Anglo-Persian Oil Co.

A resolution deploring the limitations being placed upon the appropriation by the CHEMICAL WARFARE SERVICE will be submitted to the American Chemical Society at an early date.

The death took place at Huelva, Spain, on February 12, of Mr. GEORGE GRAY, lately with the Tharsis Sulphur & Copper Co., Ltd.

One hundred years ago, ALEXANDER GARDNER discovered naphthalene in the tar oil which then constituted an undesirable by-product of the oil gas industry.

The death occurred at Dublin on February 27 of Sir CHARLES A. CAMERON, M.D., who, since 1862, had held the position of public analyst for Dublin. He was in his 92nd year.

MR. S. A. MACCALLUM has been appointed as the new directorate representative of the Glasgow Chamber of Commerce on behalf of the Scottish Section of the Society of Chemical Industry.

Among the firms recently elected members of the Federation of British Industries are the Chemical Supply Co., Old Barking Gas Works, and Hanger, Watson & Harris, Ltd., Stoneferry Works, Hull.

Tests prescribed by the Board of Trade for determining the amounts of combustible matter in coal dust mixtures which contain carbonates were published recently in the *London Gazette*.

THE IMPORT OF DYESTUFFS FROM GERMANY during January, compared with the previous month, shows a decrease of £403,440. This is due to a big drop in alizarine, synthetic, indigo, and other classes of finished dyestuffs and tanning extracts.

OVER 1,000 MEN will be provided with work as a consequence of the restarting of both the Pacific and the Graicola Patent Fuel Works, Swansea, on February 24, and the Atlantic Patent Fuel Works which restarted on Monday.

SOAP MANUFACTURERS in Central Germany have amalgamated under the style of "Wismi" with offices at Leipzig with a view to strengthening their mutual interests in regard to raw material, sales and advertising.

The Chilean Government has been authorised to issue a loan of £2,000,000 to start various public enterprises in order to provide work for men unemployed through the CLOSING OF CERTAIN NITRATE FACTORIES.

Mr. G. D. DELPRAT has resigned his position as general manager to the Broken Hill Proprietary Co., Ltd., and has been appointed consulting engineer, and Mr. Essington Lewis assistant-general manager, has been appointed general manager in Mr. Delprat's place.

The board of the ENGLISH OILFIELDS, LTD., state that further investigation as to the presence of sulphur in the shales on the company's Norfolk properties confirms the assurance given by the chairman at the recent annual meeting, that the sulphur question presents no difficulties.

One BAVARIAN GRAPHITE COMPANY has closed down and other companies are in a critical condition owing to the coal shortage and foreign competition. A State-subsidised research institute has been established with the view to the development of the industry.

At the first ordinary general meeting of the Reliance Fuel Co., Ltd., Mr. H. Houlder, J.P., said that at the plant at Llanelly four presses for the manufacture of "Ovoid" briquettes were in operation, and that presses for the MANUFACTURE OF RECTANGULAR PATENT FUEL were practically ready.

A statement issued by the Department of Statistics, India, shows that the EXPORTS OF MANGANESE ORE from British India during the six months ended September 30, 1920, totalled 342,233 tons, as compared with 141,280 tons in the corresponding period of 1919.

At the first meeting of the Joint Industrial Council for the SEED-CRUSHING and COMPOUND CAKE MANUFACTURING INDUSTRY Mr. J. W. Pearson, of the British Oil and Cake Mills, Ltd., and Alderman W. Devenay, of the Dock, Wharf, Riverside and General Workers' Union, were unanimously elected joint chairmen.

On Thursday night, Mr. MAX MUSPRATT, chairman of the United Alkali Co., Ltd., gave a lecture on "The Present Position of the Chemical Industry in England," at the Central Municipal Technical School, Byrom Street, Liverpool. Mr. A. T. Smith (director Castner-Kellner Alkali Co., Ltd.), was in the chair.

The Secretary of the Department of Scientific and Industrial Research announces that the BRITISH RESEARCH ASSOCIATION FOR LIQUID FUELS FOR OIL ENGINES INDUSTRY has been approved. The secretary of the committee engaged in the establishment of the association is Mr. Percy Still, M.I.E.E., 19, Cadogan-gardens, S.W. 1.

Lecturing before the Sheffield Section of the National Association of Industrial Chemists on February 25, Mr. A. B. Searle explained the NATURE OF THE COLLOIDAL STATE, how to distinguish colloidal substances from others, and showed by experiments some of the chief properties of colloidal substances. The lecture was illustrated by lantern slides, and an ultramicroscope.

According to a table issued by Sir Philip Lloyd-Greame, Parliamentary Secretary to the Board of Trade, OUR IMPORTS FROM GERMANY of potassium nitrate, silver nitrate, and dyes and dyestuffs, obtained from coal tar totalled 241 cwt. 13,934 lb. and 23,732 cwt. respectively, for the September quarter of 1920, while for the December quarter the amount was 16,128 cwt. 29,475 lb., and 59,366 cwt.

In a recent issue of the Transactions of the American Electrochemical Society two investigators point out that copper and manganese have a mutual action in their effect on the ATMOSPHERIC CORROSION OF IRON. Copper alone reduces the corrosion of pure iron, and to a still greater extent that of steel containing manganese, the latter enhancing the effect of the copper. If manganese is replaced by chromium the effect is still more pronounced.

Samples taken from IRON-ORE DEPOSITS in the vicinity of Woodstock railway station in North Queensland, which were inspected recently by the Queensland Government geologist, assayed 66·1, with traces of phosphorus and sulphur. Another outcrop close by assayed 62·2 iron and 6·2 silica. At Cattle Creek, about a mile distant, there is an important magnetic lode, which in the old days was mistaken for wolfram. Many thousands of tons are available on the surface, and the iron values are as high as 67·7 per cent.

A Committee of the Advisory Council of Science and Industry of South Australia has given its attention to the question of salt production, with a view to the manufacture of alkalies, and the general EXTENSION OF THE SALT INDUSTRY IN SOUTH AUSTRALIA. Experienced witnesses stated before the Committee that only a proportion of South Australia's available salt is used every year, and owing to the present system of recovery, thousands of tons of salt each year remain unrecovered.

SIR WILLIAM TILDEN has written for publications by George Routledge & Sons, Ltd., a book on "Famous Chemists: The Men and their Work," in which the lives of 21 leading chemists, from Robert Boyle to Sir William Ramsay, will be dealt with in a non-technical manner. The sketches, while chiefly biographical in character, will give attention to the social and political conditions of the times in which the subjects dealt with lived, in order to show the relation of discovery in physical science to the progress of civilisation.

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Patent Literature

Abstracts of Complete Specifications

158,002. COAL, OIL SHALE, WOOD, PEAT AND THE LIKE, PROCESS AND APPARATUS FOR THE LOW AND MEDIUM TEMPERATURE CARBONISATION OF. J. R. Garrow, 30, Vineyard Hill Road, Wimbledon, S.W. 19. Application date, July 31, 1918.

The object is to obtain an increased yield of by-products such as oils of the paraffin series, ammonia, pyroligneous acids, &c., by the destructive distillation of coal, oil shale, wood, peat, &c. The heating of the charge is effected by passing producer gas from an adjacent producer into the retort in contact with the material, but without combustion of the producer gas. The material is thus heated to 450°-1,000°C. with less expenditure of fuel than by external heating. Reference is directed in pursuance of section 7, sub-section 4, of the Patents and Designs Acts, 1907 and 1919, to Specifications 13,830/1899, 18,279/1900, and 1,676/1914.

158,010. IRON, STEEL AND CERTAIN OTHER METALS, METHOD OR PROCESS FOR COATING WITH ALUMINIUM. John Thompson (Wolverhampton), Ltd., W. J. Thompson and H. E. Partridge, Ettingshall Engineering Works, Wolverhampton. Application date, July 25, 1919.

Metals such as iron, steel, copper, brass, or phosphor bronze, having a substantially higher melting point than aluminium, are coated with cold-drawn linseed or other oil or spirit and heated in a furnace to a temperature sufficient to burn off the oil. Further coatings of oil are added and aluminium dust is applied to the surface. The metal is then heated to such a temperature that the aluminium is melted and the oil burned off, when the aluminium adheres to the metal. The process may be repeated to obtain a thicker coating, or sheet aluminium may be sweated on to the aluminium-coated surface.

158,148. ELECTROLYTIC GAS GENERATORS. I. H. Levin, 2,635, Penn Avenue, Pittsburgh, Pa., U.S.A. Application date, December 31, 1919.

The object is to provide means for the circulation of the electrolyte within a cell from one compartment to another while preventing the passage of gas. The cell *a* is provided with a metallic frame *b* supporting a diaphragm *c*, the frame

Fig. 1.

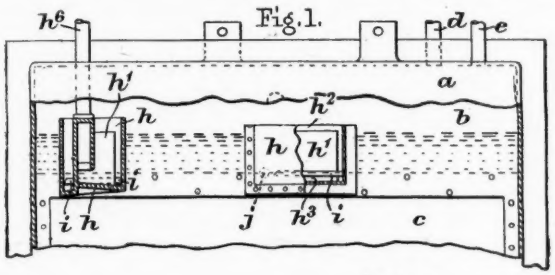
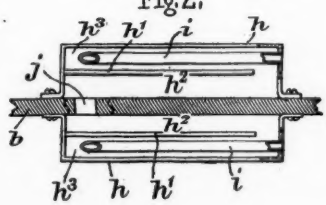


Fig. 2.

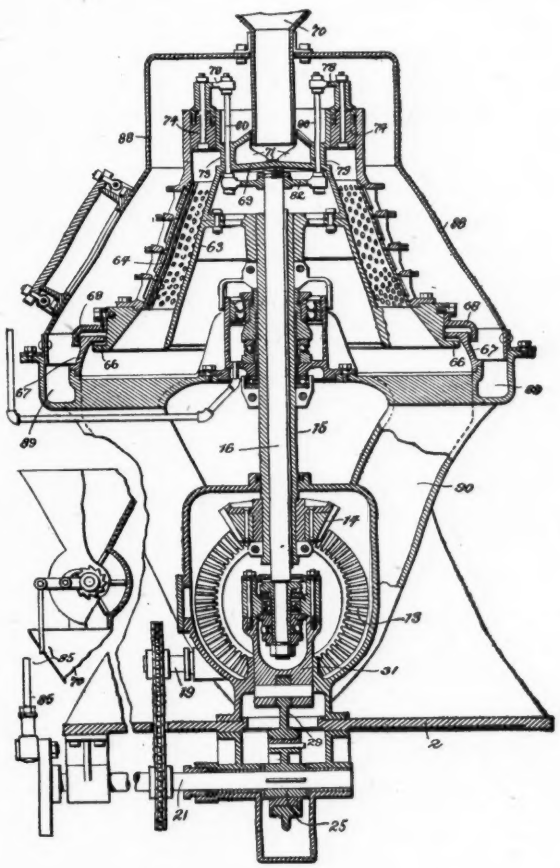


158,148

and diaphragm dividing the lower portion of the casing into two compartments having gas offtake pipes *d* and *e*. The casing *h* is partly submerged in the liquid on both sides of the partition *b*, and the compartments thus formed are provided with partitions h^1 dividing them into two compartments. A small tube *i* projects from one end of the casing nearly to the other end, as shown in the enlarged sectional plan. Liquid may thus pass from one side of the diaphragm *b* to the other through a tortuous passage formed by a tube *i*, passages h^3, h^2, and opening *j*. This passage is sufficiently long to ensure that all gas bubbles are separated from the liquid before it reaches the opening *j* in the partition, and the gas rises through the opening in the top of the casing *h* into the gas space of the cell. This device may also be arranged between the electrolytic cell and the feed tank, in which case a pipe h^6 connects the passage h^2 with the feed tank.

158,152. CENTRIFUGAL DRYER. G. H. Elmore, Swarthmore, Pa., U.S.A. Application date, February 9, 1920.

The liquid-extracting device consists of a cone 63 secured to the upper end of a hollow shaft 15 and carrying a concentric perforated cone 64. The latter is provided with flanges 66, 68 which co-operate with the flange 67 carried by the casing



158,152

to prevent any passage of material at the lower end of the rotor. The cone 63 is provided with closed top 69 which receives the material to be treated from a hopper 70, and the material is distributed by curved blades 71 to the space between the cones. The liquid passing through the perforated cone is retained by the casing 88 and discharged through a channel 89. The dried material passes downwards through passages 90 to the base plate 2. The upper portion of the screen 64 is cylindrical and forms an annular chamber fitted with an annular piston 74. The piston carries radial arms 78 which are supported on vertical rods 80 carried by a spider 82 which is mounted on the vertical shaft 16. The shafts 15, 16 rotate together, but the shaft 16 is movable vertically with

respect to the shaft 15, and is given a vertical reciprocation so as to reciprocate the piston 74. The shaft 15 is driven from a main horizontal driving shaft through bevel gearing 13, 14, and the same driving shaft operates a shaft 19 through worm gearing. The shaft 19 drives a shaft 21 which carries an eccentric 25 having adjustable eccentricity. This eccentric is connected by a rod 29 to a member 31, by means of which the shaft 16 is reciprocated without interfering with its rotation. The material is fed to the machine in measured amount by a feeding device operated by a reciprocating rod 85, and this material is periodically fed downwards into the cone 64 by the piston 74 moving across the outlet 73. The gearing for operating the shafts 15, 16 is carried within an oil-tight casing.

158,166. FURNACE ARCHES. P. J. O'Donnell, 4,409, Calumet Avenue, Chicago, Ill., U.S.A. Application date, March 20, 1920.

A furnace roof which is composed of large blocks which are allowed slight relative movement is provided with a separate suspending device for each block. The block is suspended on a horizontal trunnion which allows slight rotation about a horizontal axis, and the trunnion is supported by a vertical chain which permits lateral movement in a direction at right angles.

NOTE.—The following specifications which are now accepted were abstracted in THE CHEMICAL AGE when they became open to inspection under the International Convention: 141,758 (Soc. l'Air Liquide), relating to hydrogen peroxide, see Vol. II., p. 700; 143,193 (M. Melamid), relating to manufacture of transformer oil, see Vol. III., p. 137; 145,035 (Glanzfaden Akt. Ges.), relating to cupric ammonia cellulose solutions, see Vol. III., p. 242; 145,582 and 146,259 (Akt.-Ges. Anilin Fabrikation), relating to artificial fertilisers, see Vol. III., pp. 293 and 353; 146,919 (Armour Fertiliser Works), relating to aluminium nitride, see Vol. III., p. 381.

International Specifications not yet Accepted

155,575-6. E. Kolshorn, 39, Ehrenbergstrasse, Dahlem, Berlin. International Convention date, December 12, 1919. Addition to 145,614.

155,575. The process described in 145,614 (*see* THE CHEMICAL AGE, Vol. III., p. 293) for producing N-dioxypropyl-*p*-aminophenol or its alkyl ethers involved the use of *a*-monochlorhydrin or glycide. Epichlorhydrin is now substituted for these. The chloro compound obtained is saponified by alcoholic potash.

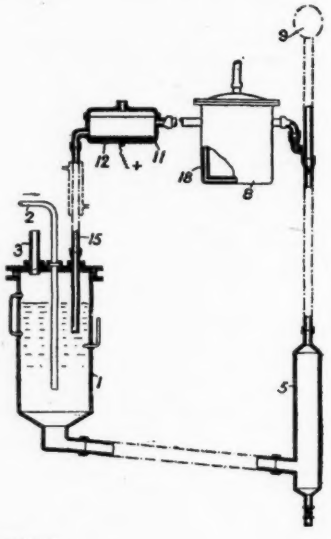
155,576. *a*-or *β*-dichlorhydrin is used in the above process instead of *a*-monochlorhydrin or glycide.

155,592. SYNTHETIC AMMONIA. Nitrogen Corporation, 55, Canal Street, Providence, R.I., U.S.A. (assignees of J. C. Clancy, 55, Canal Street, Providence, R.I., U.S.A.). International Convention date, December 20, 1919.

A catalyst such as potassium ferricyanide, calcium ferrocyanide or other alkali or alkaline earth-iron-cyanide. The catalyst is deposited on pumice and rendered active by passing a mixture of nitrogen and hydrogen at atmospheric pressure and at a temperature of 360°C. over it. The catalyst is then subjected to the action of a mixture of nitrogen and hydrogen at 100 atmospheres' pressure and at a temperature of 450°C. until the issuing gas is free from hydrocyanic acid. The catalyst is then heated to 600°C. for a short time and is ready for the ammonia synthesis which is effected at 100 atmospheres' pressure and a temperature of 450°C.

155,775. ACETALDEHYDE, MANUFACTURE OF. Stockholms Superfosfat Fabriks Aktiebolag, 4, Kornhamnstorg, Stockholm. International Convention date, December 16, 1919.

Acetaldehyde is produced catalytically by passing a current of acetylene by a pipe 2 into a vessel containing a hot solution of mercury sulphate in dilute sulphuric acid, and is drawn off through the pipe 3. The solution is circulated in a closed circuit first to a separator 5, where mercury sludge and aldehyde-resin are removed, and then to a steam-jacketed still 8, where the remainder of the acetaldehyde is distilled off. The solution then passes to an electrolyser 11, having a mercury anode 12, so that fresh mercury sulphate is added to it before its return to the vessel 1. If ferric salts are added to the solution in the vessel 1 to prevent the formation of mud, these are also re-oxidised by their passage through the electrolyser. The mud separated in the vessel 5 may be converted into mercury and used in the electrolyser. If the still 8 is a vacuum still a steam jacketed pipe 15 is provided to re-heat the solution to the required temperature.



155,775

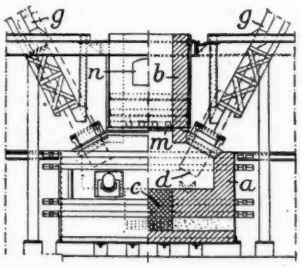
155,776. CHEMICAL REACTIONS, EFFECTING. M. Erutzkus, 6, Rue Veloy, Paris. International Convention date, December 22, 1919.

Chemical reactions are effected at a predetermined temperature and pressure in the cylinder of a compressor by starting the reaction at a selected point in the cycle which depends on whether the reaction is endothermic or exothermic. The temperature may be controlled by injecting heating or cooling liquids into the cylinder. Catalysts may be carried by the piston or placed in the compression space. Details are given for the manufacture of acetaldehyde formaldehyde, acetic acid, hydrocyanic acid, pyridine and pyrol from acetylene; formaldehyde from hydrogen, carbon monoxide and dioxide; sodium acetate from carbon monoxide and caustic soda; acetic acid from steam and carbon monoxide; synthetic ammonia; polymerisation of acetylene; cracking of hydrocarbons; hydrogenation of fatty acids; ozone by electric discharge and subsequent oxidation of methane, acetylene, &c., nitrogen oxides and oxygen from air; chlorine by the Deacon process; sulphur trioxide by the contact process; and ammonium carbonate.

155,777. LEAD, ZINC AND COPPER ORES, TREATING. A. Counas, Paris, International Convention date, August 29, 1919.

Ores of lead, zinc or copper which are unroasted or partly roasted are smelted in an electric furnace *a*, having a shaft *b*, which is narrower than the furnace in the section shown, but is of the same width in a direction at right angles. One or more pairs of inclined water-jacketed electrodes *g* are provided, and also a hearth electrode *c* of the same cross-section as the shaft *b*, and immediately below it. Lead ore containing 7-8 per cent. of sulphur is mixed with coke, and about twice the theoretical quantity of iron oxide, and the temperature is raised to about 1,300°C. by regulating the electrodes when a slag consisting of silica, ferrous oxide and lime is produced, which melts at about 1,300°C. Volatilised lead rises into the shaft *b*, and is there condensed, and the reduced iron combines with the sulphur. When treating zinc ore, the ore is mixed with flux and coke, and with iron oxide if sulphur is present, and fed into the shaft *b*. Air is admitted through inlets *m*, and fumes are drawn off through an opening *n* to a condenser for the oxide and sulphate. A temperature of about 1,400°C. is maintained for an ore containing 20 per cent. of zinc, and other

products, such as waste from ore separators, or poor calamines containing 8-12 per cent. of zinc, may also be treated. When copper ore is treated for the production of matter containing a predetermined amount of sulphur, the furnace hearth is provided with lateral air inlets and gaseous products are drawn off through the flue *n*.



155,777

155,778. WATERPROOFING COMPOSITIONS. C. Claessen, 8, Hindersinstrasse, Berlin. International Convention date, April 1, 1919.

Nitrocellulose is mixed with substituted urea or its thio or halogen derivatives, or other non-volatile liquid gelatinising agent which is not readily inflammable, to produce a composition which may be applied to fabrics.

155,781. CALCIUM IODIDE COMPOUNDS. W. Spitz, 83, Konigstrasse, Eichwalde, near Berlin. International Convention date, March 10, 1916.

Calcium iodide compounds for therapeutic purposes are obtained by crystallising a mixture of the iodide solution in water or alcohol with a neutral organic derivative of ammonia. Compounds of the iodide with glycocoll, glycylglycine, alanine, urea and ethyl urethane are described.

155,782. FATTY ACIDS BY HYDROGENATION OF OILS, &C. J. Starrels, 623, Delaware Avenue, Buffalo, N.Y., U.S.A. International Convention date, March 1, 1916.

Corn, cottonseed, coconut, fish or whale oil, tallow, grease, &c., are hydrogenated in presence of a catalyst such as nickel, until the melting point reaches 60-62°C., and the iodine number 0—2. The hydrogenated oil is then split by the Twitchell process, and the fatty acids dissolved in hot denatured alcohol or gasolene and separated by cooling. The acids are pressed to remove residual solution containing impurities. The acids are suitable for soap-making, &c.

155,792. ZINC, OBTAINING BY ELECTROLYSIS Electrolytic Zinc Co. of Australasia Proprietary, 360, Collins Street, Melbourne. International Convention date, December 24, 1919.

The object is to remove chlorine from zinc solutions before electro-deposition of the zinc to prevent corrosion of the lead anode and aluminium cathode which are usually employed. The roasted ore is treated with spent electrolyte, which contains sulphuric acid, and the liquid is purified by adding zinc dust. A portion is withdrawn, acidified with sulphuric acid, and sufficient silver sulphate is added to precipitate all the chlorine except 2-3 mg. per litre. Further zinc solution is added to render the liquid neutral or alkaline, and the mixture agitated so that the silver chloride may settle quickly. The liquid is decanted, passed through a filter press, and traces of silver removed by adding zinc dust. The solution is again filtered and is ready for electrolysis. The remainder of the original liquor is mixed with the silver chloride, and sulphuric acid and zinc dust are added to reduce the chloride to the metal and dissolve all the zinc. The liquor is filtered by means of a vacuum pump, and the silver dried and heated to 250-300°C., with the equivalent amount of sulphuric acid, to obtain silver sulphate which is used again. The process is therefore cyclic.

LATEST NOTIFICATIONS.

149,143. **Process of treating ore and like materials.** Trent Process Corporation. Feb. 21, 1920.

158,890. **Manufacture of carbon electrodes.** Szarvasy, I. Nov. 29, 1917.

158,891. Manufacture of pure retort carbon. Szarvasy, I. Feb. 28, 1914.

158,906. Manufacture of alcohol. Badische Anilin and Soda Fabrik. Feb. 9, 1920.

159,131. Process and apparatus for continuous rectification of liquid air or other liquefied gases. Barbet et Fils et Cie, E. Feb. 11, 1920.

159,135. Recovery of lead and silver from sulphide ores and metallurgical products. Amalgamated Zinc (De Bavay's), Ltd. Feb. 13, 1920.

159,142. Process of producing coke. Trent Process Corporation. Feb. 21, 1920.

159,153. Process for the preparation of di-substituted 2-4-diketo-tetra-hydro-oxazoles. Soc. Chimique Des Usines Du Rhone Anciennement Gilliard, P. Monnet et Cartier., Feb. 16, 1920.

159,156. Process for the manufacture of sulphuric acid. Kaltenbach, M. H. Feb. 18, 1920.

159,175. Method of producing gas. Bates, L. W. Feb. 19, 1920.

Specifications Accepted, with Date of Application

129,649. Glycerine from the residue obtained in the distillation of fermented liquids, Process and apparatus for the continuous distillation of. E. Barbet et fils et Cie. July 11, 1918.

135,197. Converting the higher molecular hydrocarbons into the lower molecular ones, Process for. Naamlooze Vennootschap Nederlandsche Lichte Olie, Maatschappij. November 12, 1918.

136,841. Soda containing water of crystallization or mixtures thereof with other substances, Process for producing. A. Welter. March 23, 1918.

137,034. Ammonium perchlorate, Manufacture of. L. M. E. Wang. December 27, 1918.

137,834. Nitric acid, Process of concentrating dilute. H. Frischer. August 31, 1916.

147, 834. Oils from fatty substances, Process of extracting. G. D. Rogers. March 7, 1919.

149,928. Blue water gas and coal gas, Plant for the manufacture of. J. Lowe. August 19, 1919.

152,300. Pulverised material, Conveying of. Fuller-Lehigh Co. October 8, 1919.

158,586. Pyroxylin solvent and pyroxylin compositions containing the same. E. M. Flaherty. July 8, 1919.

158,614. Gas producers, Valves for. A. Hall. October 30, 1919.

158,620. Water, Process for the softening or purification of. B. F. Rushton. November 3, 1919.

158,622. Coal, lignite, shale and like materials, Apparatus for the carbonisation of. G. F. Bale. November 4, 1919.

158,663. Filtering apparatus, Arrangement and construction of. C. J. Haines. November 7, 1919.

158,708. Ore separating devices. A. H. Jones. November 11, 1919.

158,783. Rubber, Process of devulcanising. J. Smith. December 24, 1919.

Applications for Patents

Angel, H. R. Treatment and reduction of sulphide refractory, &c. ores. 6,232. Feb. 24.

Atack, F. W. Manufacture of anthraquinone dye-stuffs. 6,063. Feb. 23.

Barnes, G. C. Centrifugal separators. 5,862. Feb. 21. (Australia, Feb. 19, 1920).

Bound Brook Oil-less Bearing Co. Manufacture of self-lubricating bearings. 6,411. Feb. 25.

Buell, R. N. Burning pulverised fuel. 6,356. Feb. 25. (Australia, April 23, 1920).

Christenson, O. L. Production of ammonium chloride in coking or distilling coal. 6,313. Feb. 24. (Sweden, March 3, 1920).

" Method of producing ammonium chloride in distilling, &c., alum slate, &c. 6,412. Feb. 25. (Sweden, March 27, 1920).

" Method of producing ammonium chloride. 6,446. Feb. 25. (Sweden, Oct. 6, 1920).

Drey, N. Production and utilisation of colouring-matters. 6,192. Feb. 24.

Farbenfabriken vorm. F. Bayer & Co. Manufacture of ethylene derivatives. 6,160. Feb. 23.

Harrington, W. T. Adaptor for converting acetylene lamps into electric lamps. 6,496. Feb. 26.

Hedman, B. A. Production of ammonium chloride in coking or distilling coal. 6 313. Feb. 24. (Sweden March 3 1920)

" Method of producing ammonium chloride in distilling, &c., alum, slate, &c. 6,412. (Sweden, March 27, 1920).

" Method of producing ammonium chloride. 6,446. Feb. 25. (Sweden, Oct. 6, 1920).

Hultman, G. H. Process for manufacture of chromium alums. 6,122. Feb. 23. (Sweden, March 1, 1920).

Imray, O. (Soc. of Chemical Industry in Basle). Manufacture of mordant dyeing dyestuffs and chromium compounds thereof. 6,036. Feb. 22.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, MARCH 3.

The past week has been one of small things. Fluctuations in price have only been within a comparatively small compass, and in many articles manufacturers are now stubbornly holding to their prices.

When realisation of stocks is further advanced, we may expect a more stable market. For the moment, however, the tendency is still in favour of buyers.

Goods are still wanted on export account, but until the financial situation changes, no substantial volume of business is to be expected.

General Chemicals

ACETONE is in poor demand and stocks are firmly held.

ACID ACETIC.—The buying continues to be of the hand to mouth variety, and there is no change in price to report.

ACID BORIC.—The price has been considerably reduced by the British manufacturers.

ACID CARBOLIC remains a dead letter.

ACID CITRIC is inclined to be rather easier. With the season approaching, holders hope for better things.

ACID FORMIC.—There is no improvement in demand and only a nominal business is passing.

ACID OXALIC.—A better turnover is reported, but prices incline in buyers favour.

ACID TARTARIC is again easier on realisation account, but stocks are thought to be comparatively small.

BLEACHING POWDER.—The market is still disturbed by Continental offerings, whereas the consumptive demand has declined enormously.

BORAX CRYSTALS.—A substantial reduction is announced by the English makers.

COPPER SULPHATE continues to sag and little business is in evidence.

FORMALDEHYDE appears to have found its level, and when local makers close down, the spot price should improve.

LEAD ACETATE is in very poor demand. Price nominally unchanged.

POTASSIUM CARBONATE AND CAUSTIC are both lower in price owing to the almost entire absence of demand.

POTASSIUM NITRATE has been further reduced by English manufacturers.

POTASSIUM PRUSSIATE is unchanged in price with few holders.

SALAMMONIAC exhibits a weaker tendency and orders are scarce.

SODA ACETATE is in much better demand. Price nominally unchanged.

SODA BICHROMATE is lower in price, but it is difficult to see how the present level can be maintained as makers do not seem to be able to produce at the price.

SODA CAUSTIC.—There are large parcels in weak second hands and the downward tendency continues.

SODA HYPOSULPHITE has rather a healthier tendency, although business is still of small dimensions.

SODA NITRITE is in fair demand and without change in value.

SODA PRUSSIATE unchanged.

Coal Tar Intermediates

A little inquiry has been received for some products, although the actual business concluded is very small. The prices for a few products are inclined to be easier.

ALPHA NAPHTHOL is without change.

ANILINE OIL AND SALT.—Inquiry for these products is maintained, and a small quantity has been sold for export.

BETA NAPHTHOL is unchanged.

DINITROCHLORBENZOL is receiving better inquiry.

NITROBENZOL is in better demand and the price is maintained.

PARANITRANILINE is without feature, and the price is easier.

PARAPHENYLENEDIAMINE is in moderate demand, and the price is steady.

PHTHALIC ANHYDRIDE is quiet, and the price is in buyers' favour.

SALICYLIC ACID is unchanged, and the price remains in buyers' favour.

Coal Tar Products

There is little change in our market from last week.

90's BENZOL is selling at 2s. 6d. on rails in the North, and 2s. 8d. to 2s. 9d. in the South.

PURE BENZOL can be bought at 2s. 9d. to 3s.

CREOSOTE OIL remains satisfactory at 11d. on rails in the North and 1s. to 1s. 1d. in the South.

CRESYLIC ACID is very quiet and is worth 2s. 6d. to 2s. 9d. for the Pale, 97/99 per cent. quality, and 2s. 3d. to 2s. 6d. for Dark, 95/97 per cent.

SOLVENT NAPHTHA is quiet at 2s. 2d. on rails.

HEAVY NAPHTHA is quiet at 2s. 3d. on rails.

NAPHTHALENE.—Crude qualities are slightly more active and a certain amount of export business has been done, but this has had no effect on the prices, which remain at from £8 to £14 per ton for Crude, while Refined is quoted £26 to £28 per ton.

PITCH.—There is no improvement in the demand and buyers are still inclined to keep off the market. Prices are more or less nominal at 115s. to 120s. f.o.b., East Coast port, and 120s. to 125s f.o.b., London.

Sulphate of Ammonia

There are no new features to report.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	6	to	0	2	9
Acetone oil	ton	90	0	0	to	95	0	0
Acetone, pure	ton	100	0	0	to	105	0	0
Acid, Acetic, glacial, 99-100%	ton	70	0	0	to	72	0	0
Acetic, 80% pure	ton	53	0	0	to	54	0	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst.	ton	72	10	0	to	74	0	0
Carbolic, cryst. 39-40%	lb.	0	0	9	to	0	0	9½
Citric	lb.	0	2	4	to	0	2	6
Formic, 80%	ton	80	0	0	to	85	0	0
Gallic, pure	lb.	0	4	9	to	0	5	0
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol.	ton	37	10	0	to	40	0	0
Lactic, 60 vol.	ton	42	10	0	to	45	0	0
Nitric, 80 Tw.	ton	41	0	0	to	44	0	0
Oxalic	lb.	0	0	10	to	0	0	10½
Phosphoric, 1.5	ton	65	0	0	to	67	0	0
Pyrogallic, cryst	lb.	0	9	6	to	0	9	9
Salicylic, Technical	lb.	0	1	6	to	0	1	8
Salicylic, B.P.	lb.	0	1	4	to	0	1	6
Sulphuric, 92-93%	ton	8	10	0	to	8	15	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	1	9	to	0	1	10
Alum, lump	ton	18	0	0	to	18	10	0
Alum, chrome	ton	45	0	0	to	50	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	13	0	0	to	14	0	0
Aluminium, sulphate, 17-18%	ton	15	5	0	to	16	0	0
Ammonia, anhydrous	lb.	0	2	2	to	0	2	4
Ammonia, .880	ton	43	0	0	to	45	0	0
Ammonia, .920	ton	30	0	0	to	32	10	0
Ammonia, carbonate	lb.	0	0	4	to		—	
Ammonia, chloride	ton	65	0	0	to	70	0	0
Ammonia, muriate (galvanisers)	ton	55	0	0	to	57	0	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	95	0	0	to	100	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	3
Amyl acetate	ton	420	0	0	to	425	0	0
Arsenic, white, powdered	ton	77	10	0	to	80	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0

	per	£	s.	d.		£	s.	d.
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	20	0	0	to	21	0	0
Nitrate	ton	55	0	0	to	56	0	0
Barium Sulphate, blanc fixe, dry	ton	30	0	0	to	31	0	8
Sulphate, blanc fixe, pulp	ton	16	10	0	to	17	0	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	0
Bleaching powder, 35-37%	ton	20	0	0	to	21	0	0
Borax crystals	ton	34	0	0	to	36	0	0
Calcium acetate, Brown	ton	15	0	0	to	17	0	0
,, Grey	ton	23	0	0	to	25	0	0
Calcium Carbide	ton	29	0	0	to	30	0	0
Chloride	ton	12	10	0	to	13	0	0
Carbon bisulphide	ton	65	0	0	to	67	0	0
Casein, technical	ton	90	0	0	to	92	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	2	to	0	1	4
Cobalt acetate	lb.	0	11	6	to	0	12	6
Oxide, black	lb.	0	16	0	to		—	
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	39	0	0	to	40	0	0
Cream Tartar, 98-100%	ton	160	0	0	to	165	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol	ton	120	0	0	to	122	10	0
Formusol (Rongalite)	lb.	0	4	9	to	0	5	1
Glauber salts	ton	Nominal.						
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	50	0	0	to	52	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	50	0	0	to	52	0	0
Carbonate (White Lead)	ton	43	0	0	to	46	0	0
Nitrate	ton	62	10	0	to	65	0	0
Litharge	ton	53	0	0	to	55	0	0
Lithopone, 30%	ton	30	0	0	to	32	10	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	12	10	0	to	13	0	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0
Manganese, Borate	ton	190	0	0	to		—	
Sulphate	ton	130	0	0	to	135	0	0
Methyl acetone	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone	gall.	Nominal.						
Nickel sulphate, single salt	ton	60	0	0	to	62	0	0
Nickel ammonium sulphate, double salt	ton	62	0	0	to	64	0	0
Potash, Caustic	ton	48	0	0	to	50	0	0
Potassium bichromate	lb.	0	1	1	to		—	
Carbonate, 90%	ton	85	0	0	to	90	0	0
Chloride	ton	50	0	0	to	52	0	0
Chlorate	lb.	0	0	8½	to	0	0	9
Meta bisulphite, 50-52%	ton	290	0	0	to	205	0	0
Nitrate, refined	ton	58	0	0	to	60	0	0
Permanganate	lb.	0	2	6	to	0	2	9
Prussiate, red	lb.	0	2	6	to	0	2	9
Prussiate, yellow	lb.	0	1	4	to	0	1	5
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	5	0	0	to		—	
Seconds	cwt.	4	15	0	to		—	
Sodium acetate	ton	35	0	0	to	37	10	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	8	to	0	0	8½
Bisulphite, 60-62%	ton	37	10	0	to	40	0	0
Chlorate	lb.	0	0	5½	to	0	0	5½
Caustic, 70%	ton	24	0	0	to	24	10	0
Caustic, 76%	ton	25	0	0	to	25	10	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial	ton	26	0	0	to	27	0	0
Nitrite, 96-98%	ton	47	10	0	to	50	0	0
Phosphate, crystal	ton	32	0	0	to	35	0	0
Perborate	lb.	0	1	9	to	0	2	0
Prussiate	lb.	0	0	8½	to	0	0	9
Sulphide, crystals	ton	22	0	0	to	25	0	0
Sulphide, solid, 60-62%	ton	45	0	0	to	47	0	0
Sulphite, cryst	ton	15	0	0	to	16	0	0
Strontium carbonate	ton	85	0	0	to	90	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	19	0	0	to	19	10	0
Roll	ton	19	0	0	to	19	10	0
Tartar emetic	lb.	0	2	6	to	0	2	9
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)	lb.	0	2	0	to	0	2	1
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	60	0	0	to	65	0	0
Oxide, 99%	ton	45	0	0	to	47	10	0
Dust, 90%	ton	90	0	0	to	92	10	0
Sulphate	ton	21	10	0	to	23	10	0

Coal Tar Intermediates, &c.

	per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined	lb.	0	4	6	to	0	4	9
Alphanaphthylamine	lb.	0	3	3	to	0	3	6
Aniline oil, drums extra	lb.	0	1	8	to	0	1	9
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.		—		to		—	
Benzaldehyde (free of chlorine)	lb.	0	5	3	to	0	5	6
Benzidine, base	lb.	0	11	6	to	0	12	0
Benzidine, sulphate	lb.	0	10	0	to	0	10	6
Benzoic acid	lb.	0	2	3	to	0	2	6
Benzoate of soda	lb.	0	2	3	to	0	2	6
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	9	6	to	0	10	0
Betanaphthol	lb.	0	3	0	to	0	3	3
Betanaphthylamine, technical	lb.	0	11	6	to	0	12	6
Croceine Acid, 100% basis	lb	0	5	0	to	0	6	3
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	6	9	to	0	7	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	3	0	to	0	3	3
Dimethylaniline	lb.	0	5	9	to	0	6	0
Diphenylamine	lb.	0	5	0	to	0	5	3
H-Acid	lb.	0	10	0	to	0	10	6
Metaphenylenediamine	lb.	0	5	9	to	0	6	0
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	6	to	0	8	0
Naphthionic acid, crude	lb.	0	4	0	to	0	4	3
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	5	0	to	0	5	6
Nitronaphthalene	lb.	0	1	6	to	0	1	8
Nitrotoluol	lb.	0	1	4	to	0	1	5
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine	lb.	0	2	3	to	0	2	6
Orthonitrotoluol	lb.	0	1	3	to	0	1	4
Para-amidophenol, base	lb.	0	12	6	to	0	13	0
Para-amidophenol, hydrochlor	lb	0	13	0	to	0	13	6
Paradichlorbenzol	lb.	0	0	7	to	0	0	8
Paranitraniline	lb.	0	6	6	to	0	7	0
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled	lb.	0	13	6	to	0	14	6
Paratoluidine	lb.	0	8	3	to	0	8	6
Phthalic anhydride	lb.	0	4	9	to	0	5	0
Resorcin, technical	lb.	0	7	6	to	0	8	6
Resorcin, pure	lb.	0	9	3	to	0	9	9
Salol	lb.	0	4	0	to	0	4	3
Sulphanilic acid, crude	lb.	0	1	8	to	0	1	9
Tolidine, base	lb.	0	8	6	to	0	10	0
Tolidine, mixture	lb.	0	2	9	to	0	3	0

Dyeing Properties of Wool

LECTURING on February 24th, on "Defects on Worsted Fabrics produced by the use of Unsuitable Oils," Dr. L. L. Lloyd, head of the dyeing department of the Bradford Technical College, stated that in no circumstances should untreated mineral oil or simply bleached mineral oil be used. He said conditioning agents greatly modified dyeing and physical properties of wool and were the most important factor leading to defective fabrics. Unless the wool had been perfectly evenly treated defects were obtained in the finished material, whatever type of dyestuff might be used. The conditioning agents contained sulphated oils and were used, no doubt, on account of their property of lowering surface tension, so that the wool was wetted readily and would absorb moisture to bring it to its full condition, but these conditioning agents had a varied effect on wool. The amount of conditioning agents which caused a modification in dyeing was from 0·06 to 0·1 per cent., amounts so small as to be difficult to detect or estimate, but sufficient to produce marked defects in the finished material.

According to Mr. T. G. Trevor, Inspector of Mines, Pretoria, the coal in the working coal mines of the Transvaal and Natal contains an average of about 1·5 per cent. sulphur in the form of pyrites. One large and several small COKING PLANTS ARE BEING ERECTED, and the demand for coke by the Pretoria Iron Mines alone, on the estimated daily output of 300 tons of iron will be some 350 tons per day.

Company News

PAN-AMERICAN PETROLEUM AND TRANSPORT CO.—Quarterly dividends on Common "A" and "B" stocks, 3 per cent., payable April 10.

MEXICAN PETROLEUM CO.—Quarterly dividends have been declared as follows:—On common stock, 3 per cent., payable April 10; on Preferred stock, 2 per cent., payable April 1.

AMERICAN SMELTING AND REFINING.—Quarterly dividend of $1 per share, less tax, on Common stock, payable March 15. Last year, dividend same.

ANGLO-PERSIAN OIL.—The underwriting of the new issue of second preference shares (*see* CHEMICAL AGE, February 26, page 262) was completed on Tuesday and it is expected that the prospectus will be issued towards the end of next week.

DRAKES, LTD.—Profit for 1920, £20,166, and £3,037 was brought in, making £23,203. After paying debenture interest and preference dividend the directors recommend a dividend on ordinary of 10 per cent. for the year; to reserve, £3,755; forward (subject to excess profits duty and other taxation), £10,817.

UNITED ALKALI CO.—A final dividend of 7s. 6d. per share, less tax, is being paid on the preference shares. No further dividend on the ordinary shares is proposed. An interim dividend of 1s. per share, less tax, was paid in July last. Last year a balance dividend of 10 per cent. was paid at this time on the ordinary shares, making 15 per cent. for the year.

INTERNATIONAL PAINT AND COMPOSITIONS.—At the thirteenth ordinary general meeting of the company held on February 25, the chairman (Col. Sir Herbert Jekyll, K.C.M.G.), said that after writing off bad debts the profit for the past year was £37,686 odd, as compared with £63,655 in 1919. The dividend on the ordinary shares was 6 per cent., as compared with 10 per cent. paid in 1919.

CARDIFF GAS LIGHT & COKE.—Presiding at the annual meeting of the Cardiff Gas Light & Coke Co., Ltd., Mr. Charles E. Dovey, F.C.A., stated that the sale of residuals during the year brought in £127,416, against £104,897 the previous year. In the residuals market at the moment, however, the outlook was not so bright. A marked slump had taken place in coke and sulphate of ammonia, and the latter was feeling the effect of German competition.

DUNLOP RUBBER.—Extraordinary meetings of shareholders held on Monday confirmed resolutions passed at the extra ordinary general meeting held on February 11. The resolutions had reference to alterations in the articles of association, mainly dealing with the extension of the powers of the directors to raise, borrow, or secure moneys for the purposes of the company, so that the amount which might at any one time be owing in respect of moneys so raised should not, without the sanction of a general meeting, exceed the sum of £6,500,000.

BRADFORD DYERS' ASSOCIATION.—At the twenty-third ordinary general meeting of the Bradford Dyers' Association, Ltd., held at Bradford, on Monday, Sir Milton Sheridan Sharp, Bart., presiding, it was unanimously resolved that a dividend at the rate of 3s. per share for the six months to December 31 last, making 4s. for the year, should be paid on the ordinary shares on March 7 and that £402,369 be carried forward. It was also resolved to vote £2,000 to the general board for their services as directors for the year to December 31 last.

LEVER BROTHERS.—At the extraordinary general meeting held on Monday, Lord Leverhulme presiding, it was decided, after some opposition, to create redeemable first mortgage debenture stock amounting to £15,000,000, exclusive of any premium, and to make an immediate public issue of £4,000,000 of such stock. Lord Leverhulme explained that this proposed issue was being made on more favourable terms to their company than any similar issue that had been placed on the market during the last few months. Referring to the agreement last year for purchase of the ordinary shares of the Niger Co. and the purchase in 1919 from Brunner, Mond & Co., Messrs. Crosfield and Gossage's ordinary shares and the purchase of Prices' Candle Co., and ordinary shares of John Knight, Ltd., he said the basis of all these purchases, including the Niger, at the time it was made was a moderate estimate of the value of the properties.

Delivery of Calcium Carbide

An Alleged Breach of Contract

IN the Commercial Court of the King's Bench Division, on Monday, Mr. Justice Rowlatt commenced the hearing of an action for alleged breach of contract, brought by the Acetylene Corporation of Great Britain, Ltd., against the Canada Carbide Co., Ltd., of Montreal.

Mr. Douglas Hogg, K.C., and Mr. Charles Doughty were for the plaintiffs; and Mr. R. A. Wright, K.C., and Mr. W. A. Jowitt for the defendants.

The action concerned two contracts entered into during the war, by which defendants were to supply the plaintiffs with 3,600 tons and 7,000 tons of calcium carbide, a very important use of which at that time was in the oxy-acetylene process of welding. Plaintiffs were suppliers to the Admiralty, and they complained, said Mr. Hogg, that during 1916, defendants, in breach of an agreement that plaintiffs were to be defendants' sole representative in this country, sold direct to the Admiralty. Defendants' explanation of the non-delivery was that they could not get shipping space. Later, it was contended, defendants began selling to the Munitions Board in Canada for shipment to this country, and at the beginning of 1919 they treated the contract as definitely at an end, appointing Messrs. McQuie, of Liverpool, their agents. The result had been that plaintiffs, in order to carry on had been forced to buy at £25 and afterwards at £35, and even £45 a ton, whereas they were entitled to buy from defendants at £14 or £15 a ton, and defendants had been able to get $90 a ton for carbide, which they had contracted to sell to the plaintiffs for $45.

The defence was that the contracts were subject to deliveries being suspended pending any contingencies beyond the control of the sellers or buyers causing a short supply of labour, fuel, raw material or manufactured products, or otherwise hindering manufacture or delivery. The contracts, said the defendants, were also "subject to steamers sailing." Defendants also alleged that severe weather had hindered the manufacture of carbide.

The case was adjourned.

The Sale of Coal Pitch

Arbitrator's Award to Stand

ON Wednesday, in a King's Bench Divisional Court, Justices Bailhache and Shearman had before them a motion by Messrs. N.A. Hughes, Ltd., to set aside an arbitrator's award in favour of Messrs. J. Brownlie & Co. (Hull), Ltd., on the ground of alleged legal misconduct by the arbitrators.

Mr. J. Oddy appeared for Messrs. Hughes, and Mr. Clement Davies for Messrs. Brownlie.

Mr. ODDY said the motion was to set aside an award published on July 30 last. The appellants, Messrs. Hughes, were the sellers, and they entered into a contract with the purchasers, Messrs. Brownlie, for the sale of 500 tons of coal pitch. The contract was made in September, 1919, and in November the coal pitch was delivered. It was a sale by sample. When it was delivered at Goole it was shipped by the purchasers to Sweden. The purchasers received a complaint from their buyers that the pitch was unsatisfactory, and stated that they might be receiving a claim against them for 40s. a ton. The pitch was sold at 52s. 6d. a ton by the vendors to Brownlies. The sellers, his clients, declined to accept the debit, and thereupon Brownlies, in view of the contract providing for arbitration, said they should insist upon that being done. On August 11 his clients received a letter from Brownlies saying an award had been made at an arbitration mutually agreed upon. His clients now sought to set aside the award, on the ground that the arbitration was wholly irregular, and that there was no taking of any evidence at all. The arbitrators came to the conclusion that Brownlies should pay one quarter and Hughes three-quarters of the total claim, with expenses. Counsel submitted that the arbitration should be set aside on the ground of legal misconduct.

The Court, without calling upon Mr. Davies, dismissed the motion, with costs.

Mr. Justice BAILHACHE saw no reason for setting aside the award. It did not state the amount to be paid, it was true, but it set out how the amount was to be paid by the parties. Mr. Justice Shearman agreed.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

Locality of Firm or Agent.	Materials.	Ref. No.
Toronto ...	Patented metal goods	244
Cape Town ...	Paints; varnishes	250
Belgium (Visé)	Glue; varnish	252
Durban ...	Fertilisers	274
Paris	Industrial chemicals and drugs ...	279
Marseilles ...	Drugs	280
Genoa ...	Vegetable oils and fats; chemical fertilisers; heavy chemicals; sulphate of copper; caustic soda; soda crystals	281
Milan... ...	Heavy and pharmaceutical chemicals	282
San Francisco	Dyes; raw material for paint manufacture and dyes	289
Buenos Aires	Oils; greases	292

Tariff Changes

British Guiana.—Under the new preferential Customs tariff, manures, vermin killers and insecticides may be imported free of duty.

Gold Coast.—The revised Customs tariff notifies import duties of 1s. per lb. on gunpowder; 3d. per gallon on benzine, benzoline, gasoline, naphtha and petrol spirits generally; 1s. 6d. per 100 lb. or part thereof on unrefined salt; and 3s. per cwt. or part thereof on soap (other than toilet).

Denmark.—Import prohibitions on fireworks and the following chemicals used in the production of explosives have been withdrawn: Nitric acid, sulphuric acid, oxalic acid, nitrates, chlorates, per-chlorates, oxalates, glycerine, carbolic acid, naphthaline, aniline, benzol, toluol, cymol, sulphur, quicksilver, phosphorus, iodine, metallic sodium and potassium, aluminium powder, calcium phosphide, sulphuret of antimony, peroxide of lead, and manganese dioxide. The importation of the following articles still remains prohibited: Explosives, ammunition, percussion caps, explosive capsules, match cord, time fuses, organic nitro-compounds, including picric acid, picrates, pyroxiline and collodion.

Finland.—Importation of the following goods is prohibited except under licence: Acetic ether, etheric and esteric solutions in alcohol, and other unspecified ethers (not including ethyl ether) and esters; terpincol, saffrol and menthol; heliotropine, cumarin and other unspecified scented substances used in the manufacture of perfumery.

France and Algeria.—The prohibitions on the export and re-export of celluloid, including artificial ivory and artificial tortoiseshell, crude, in lumps, plates, or sheets, not worked, tubes, rods, and sticks, have now been withdrawn.

Italy.—The importation of and trade in, mineral oils, crude and refined, is now free from restriction. The transit and re-export of these oils is also free, subject to the existing Customs regulations.

Poland.—The import duties leviable on the following articles are to be suspended until April 1: Bones prepared with sulphuric acid, fertilising compositions and mixtures; calcined bones and bone ash, mineral superphosphates, ground graphite, nitrate of ammonia, ammonium sulphate, Glauber's salt, sulphuric, nitric and hydrochloric acids, and dye earths (Cassel, Verona). Reduced Customs duties are notified for ammoniacal soda and soda crystals, sulphide of sodium, hydro-sulphate of soda, nitro and amido derivatives of the aromatic series, naptho and sulpho derivatives, hydrosulphate of lime and sulphuric ether.

Switzerland.—Under the new rates of hallmark and "verification" tax on certain imported articles, laboratory apparatus of platinum is liable to a charge of from 50 centimes to 10 francs per article according to weight. Full particulars of the rates may be obtained from the Tariff Section, Department of Overseas Trade, 18, Queen Anne's Gate, Westminster, S.W. 1.

Chemical Matters in Parliament

Chemical Warfare

Lieut-Commander Young (House of Commons, 24th February) asked the Prime Minister whether any communication has been received by His Majesty's Government from the League of Nations about the use of gas or other poisonous substances in warfare; and, if so, to what effect?

Mr. Chamberlain: The question of chemical warfare has, it is understood, been considered by the Permanent Advisory Commission of the League of Nations for Military, Naval and Air Questions, but the League has not yet communicated any definite pronouncement on the subject.

Soap Monopolies

Mr. Allen Parkinson (House of Commons, 23rd February), asked the President of the Board of Trade whether, in view of the Report of the Sub-Committee of the Standing Committee on Trusts that, owing to the fact that the United Kingdom Manufacturers' Association, controlled by Messrs. Lever Brothers, has no effective competitor except the Co-operative Wholesale Society, and that, in consequence, the public has been obliged to pay an excessive price for soap, he will indicate what steps he proposes to prevent the further trustification of industry?

Sir P. Lloyd-Greame: It is hoped if time permits to introduce permanent legislation dealing with the question of trade monopolies, but I regret that at present I am not able to make a definite announcement on this subject. The Profiteering Acts have been applied to soap, and it is open to anyone who considers that he has been charged a price which yields an unreasonable profit to the seller to lodge a complaint with the Central Committee (in respect of a wholesale transaction) or the appropriate local committee (in respect of a retail transaction).

Potash Industry

Mr. Doyle (House of Commons, February 28) asked the President of the Board of Trade whether financial assistance was given to the British potash industry during the war; if so, on what grounds; and whether any such assistance is being afforded to the industry to-day?

Sir R. Horne: Some financial assistance was given during the war to the British potash industry, because an increased production of potash in this country was required in the interests of agriculture and of various manufactures such as optical glass and certain chemicals.

Key Industries Bill

Mr. G. Terrell (House of Commons, February 28) asked the Prime Minister when the Bill to safeguard key industries and to regulate imports will be introduced?

Mr. Lloyd George: I hope that it may be possible to introduce it before Easter, so that it may be proceeded with as soon as the House re-assembles.

State-Supported Industries

Major Barnes (House of Commons, February 28) asked the President of the Board of Trade what industries are now in such a financial position as to require for their maintenance the assistance of the Government?

Sir R. Horne: So far as financial assistance is concerned, I would call attention to Return No. 180, dated 31st July, 1920, which gives particulars of the public money invested by the Government at that date in registered companies carrying on various industries. The dye industry is receiving asistance in accordance with the scheme outlined in the White Paper (Cmd. 9194 of 1918), and particulars as to the grants and loans made were given in this House on the 6th December last, in reply to a question by the hon. member for West Derbyshire. As regards assistance by way of legislation, I may point out, so far as the Board of Trade are concerned, that the dye industry has been dealt with by the Act passed last Session, and the Bill referred to in the King's Speech will contain the proposals of the Government in relation to other industries.

Mr. G. Gerard Wilson, general manager of the Whitwood Chemical Co., Ltd., was the recipient of a "Portland Vase" dinner service, subscribed for by the officials, staff and workmen, in honour of his recent marriage. Miss C. Newton made the presentation, and speeches were made by Mr. J. Wilkinson and H. Peckett. Mr. Wilson suitably responded, thanking all concerned for the gift.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Bankruptcy Information

MANN, W., "Greenbank," Camborne Road, Sutton, Surrey MANN, F., 66, Turney Road, West Dulwich, London, and HOSEY, J. P., 20, Bishop's Road, London, produce merchants, under the style of Mann and Cook, at 7, St. Michael's Alley, Cornhill, London, E.C., and also at 8, Chatham Street, Manchester; Royal Liver Buildings, Liverpool; 120, Broadway, New York; Via San Lorenzo No. 11 int., 20, Genoa; Oppert, 74, Rotterdam, and 247, George Street, Sydney, Australia. Date of receiving order, February 23, 1921.

Companies Winding Up Voluntarily

BRITISH ELECTRO-CHEMISTS, LTD. A meeting of creditors will be held at 1, Broad Street Place, London, on Wednesday, March 9, at 12 noon. H. J. Gully, Liquidator.

CHEMICAL ENGINEERING CORPORATION, LTD. (in voluntary liquidation).—A meeting of creditors will be held at the offices of the Liquidator, Metron Chambers, 244, High Holborn, London, W.C.1, on Thursday, March 10, at 2.30 p.m. W. Elles-Hill, Liquidator.

Liquidators' Notices

ANGLO-FRENCH PETROLEUM SYNDICATE LTD. (in liquidation).—The adjourned general meeting will be held at 278-279, Dashwood House, New Broad Street, London, E.C., on Thursday, March 31, at 12 noon. W. Goldie, Liquidator.

THE DOWNTON PETROL AIR GAS CO., LTD.—A meeting of creditors will be held at 34, Castle Street, Salisbury, on Saturday, March 12, at 10.30 a.m. S. G. Best, Liquidator.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.]*

ALBY UNITED CARBIDE FACTORIES, LTD., London, E.C.—Reg. Feb. 16, charge by way of additional security for securing £45,000, including £15,000 secured by an indenture dated Dec. 29, 1920, to Hoare & Co.; charged on a certain enemy debt and certain shares, &c. *£132,947 1s. Aug. 13, 1920.

BRITISH GLASS INDUSTRIES, LTD., London, E.C.—Reg. Feb. 15, £400,000 debentures (filed under sec. 93(3) of the Companies (Consolidation) Act, 1908), present issue £250,000; general charge (except uncalled capital). *Nil. Dec. 22, 1920.

DUMA RUBBER CO., LTD., London, E.C.—Reg. Feb. 15, £15,000 debentures (filed under sec. 93(3) of the Companies (Consolidation) Act, 1908), present issue £7,500; general charge. *Nil. Dec. 30, 1920.

ROUMANIAN CONSOLIDATED OILFIELDS, LTD., London, E.C.—Reg. Feb. 19, £25,000 debentures, part of £250,000; general charge. *£142,400. Dec. 27, 1920.

STANDARDISED CHINA CLAY CO., LTD., London, E.C.—Reg. Feb. 15, £125 debentures, part of £7,000; also reg. Feb. 15, £1,000 debentures; general charge. *Nil. April 2, 1920.

WIGAN ELECTRO-METALLURGICAL WORKS, LTD., Liverpool.—Reg. Feb. 16, £1,500 debentures; general charge. *—. Dec. 31, 1919.

Bills of Sale

[The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of 1882 and under the Act of 1878. Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice had been entered on the Register.]

TOWNSEND, B. J., 477, Stanton Road, Stapenhill, chemical manufacturer. Filed Feb. 28. Deed of gift.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

HOOKE, A. E., 83, Upper Thames Street, London, E.C., rubber merchant. £12 1s. 4d. Jan. 18, 1921.

WAEN SILICA SAND CO., Gwernaffield, near Mold, silica merchants. £12 18s. Jan. 12, 1921.

Manchester Chemical Trade

Sir S. W. Royse and Co's Monthly Report

There has been only a limited business in chemicals passing during this month, and that principally for the home trade, the export demand being very poor. The values of most products have eased further, but consumers continue to cover only their immediate requirements. Sulphate of copper is again lower in spite of the firm position of the metal. The home demand is small, and although the official returns for January show an increase in exports, the amount of new business passing is limited. Green copperas has been steadily called for.

There has been little inquiry for acetates of lime, but a fair amount of business has been placed in acetate of soda. Acetic acid is unchanged. Acetates of lead continue to be neglected and nitrate of lead has also been in poor request. The possibility of legislation restricting the importation of potash compounds has so far not affected the market here. The demand for carbonate of potash and caustic potash is very moderate and prices are lower. Stocks of Montreal potashes are ample. Sulphate of potash has an easier tendency. Yellow Prussiate of potash has been receiving more attention, but the demand for prussiate of soda is still poor, and price is again lower. Resale parcels of white powdered arsenic have affected the market and trade is confined to small lots. There has been little inquiry for tartaric acid for the home trade, but a fair amount of business is reported for export. Cream of tartar continues to be pressed for sale by holders of stocks, and until these are cleared there seems little prospect of better prices. Citric acid has remained steady.

British makers of bichromates reduced their prices early in the month, but stocks of both home and American makes are still offering at less money. Oxalic acid is again cheaper, and is offered freely from the Continent. Borax and boracic acid are unchanged, and there is little call for phosphate of soda. Prices of alum and sulphate of alumina are easier, especially for export. Muriate of ammonia and salammoniac have been moving only slowly and stocks have accumulated. White caustic soda has been in rather better request but other soda compounds have been little called for. Tar products generally remain depressed with little business doing and prices uncertain. Benzole and toluole are quiet with few inquiries. There is little call for solvent naphtha and prices are lower. Creosote, if anything, is also easier. Crude carbolic acid is lifeless; cresylic and crystal carbolic acids are also pressed for sale. The demand for naphthalene is small and prices are still falling. Pitch remains dull, with values still on the downward grade, and buyers on the Continent have been taking some supplies from Germany at very low figures. Sulphate of ammonia is practically unchanged.

PUBLISHER'S ANNOUNCEMENT

New "copy" for advertisements must arrive on or before Friday preceding date of publication. Blocks with solid black background are not accepted. Line blocks are preferable to half tones.

All advertisements other than full page size, must be enclosed in a complete rule border.

TARIFF.

Agencies.
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1d. per word, minimum 2s.; 3 insertions for price of two.

WANTS
SECTION OF THE
Chemical Age
8, BOUVERIE STREET, LONDON, E.C.4.

Tariff (cond.)

Situations Wanted.

1d. per word, minimum 2/0; 3 insertions for price of two.

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4/6 per half inch per insertion. 8/0 per inch per insertion.

MACHINERY, PLANT, &c. FOR SALE

ACETYLENE WELDING PLANT FOR SALE, with set of welding pipes for welding up to ½ in. thick, complete plant; ready for use, New; £25.—TUNGAY, Union Bank-chambers, Oldham.

AN EXCELLENT OVAL, STEAM JACKETTED, CHAMBER, by Manlove Alliott, 7 ft. long by 6 ft. high by 3 ft. 6 in. across widest part, fitted with galvanised wire cage. A first-class HORIZONTAL, JACKETTED, STEEL MIXER, by J. Frazer, Ltd., 2 ft. 8 in. diameter by 8 ft. long, with agitators, bevel and spur gearing, and fast and loose pulleys. A nearly new HYDRAULIC, CIRCULAR, STRAINER PRESS, by Buxton & Thornley, fitted with galvanised iron basket, 2 ft. 6 in. diameter by 2 ft. 6 in. high, copper internal strainer, cast-iron cover, steel columns and bed-plate. Large quantity of circular and other TANKS.—E. T. PUGSLEY, Willett Road, Thornton Heath, Surrey.

COMBINED PAINT PUGGER & CONE GRINDER, Hopper 26 in. by 19 in., disc 19 in., belt power, ex stock; inspection these works.—H. H. ENGINEERING CO., LTD., Hemel Hempstead, Herts.

DISINTEGRATORS.—Two nearly new, O.O. Christy & Norris machines, finger feeds, ring-oiling bearings, latest type; also two 1½-size Christy & Norris ring-oiling bearings, high numbers. For sale, cheap, apply quickly.—RICHARD SIZER, LIMITED., 21, Dale Street, Liverpool.

FOR IMMEDIATE DISPOSAL, ROLLER MILL (Hind and Lund), Rolls 30 in. by 14 in. Hexagon Reel, 2 sheets long, by Dell. Centrifugal Dressing Machine, 2 sheets long. One Brush Sifter, Dell's. Two Elevators, 26 ft. centres; 1 Elevator 15 ft. centres, 2 pairs Millstones and Hursting. All in practically new condition.—Offers invited for the lot or separately. Can be inspected by appointment, or price and particulars from READWIN, 134, High Street, Cheshunt, Herts.

GALLOWAY BOILER, 20 ft. × 6 ft. 6 in., 80 lbs. pressure, all fittings as fixed, £300. CORNISH BOILER, 26 ft. × 6 ft., 75 lbs. pressure, £150. CORNISH BOILER, 14 ft. × 5 ft. 6 in., 80 lbs. pressure, £150. All the above in first-class order, for immediate delivery. Seen in London.—E. T. PUGSLEY, Willett Road, Thornton Heath, Surrey.

JACKETED COPPER PAN.—Enclosed 3,000 gallons, 9ft. 9 in. dia. × 8ft. 4 in.; jacket, 3ft. up; 50 lb., working pressure.—C. F. DAVIS, 22, Billiter Street, London, E.C.

ONE 30-in. BELT-DRIVEN HYDRO, by Summer-scales, suspended type, with perforated steel basket.—C. F. DAVIS, 22, Billiter Street, London, E.C.

ONE DRYING CUPBOARD.—By Brown & Sons, 7 ft. long × 5 ft. high, 2 compartments, 14 pairs angle-iron supports, 24 wired Glass Trays 23½ × 23½ in.—C. F. DAVIS, 22, Billiter Street, London, E.C.

ONE WERNER MIXER.—Trough 4 ft. long × 2 ft. 9 in. deep, with worm blade 6 in. wide, with tipping apparatus. Five Dough Mixers having troughs 20 × 20 in. deep, double mixing blades, hand tipping gear and balance weights.—C. F. DAVIS, 22, Billiter Street, London, E.C.

ON SALE, TANK OR EGG-END BOILER, 10 ft. × 5 ft., very strong, ⅜ in. plates, last working pressure 50 lbs.—PICKUP, Park Street, Royton.

PUG MILL, overdriven type, cly. 24 in. by 24 in., blades for putty or paint, or to suit clients' requirements, belt-power, ex stock.—H. H. ENGINEERING CO., LTD., Hemel Hempstead, Herts.

THREE SETS PAINT TRIPLE GRANITE ROLLER MILLS. One by Torrance, having Rolls 28 in. long × 12 in. dia.; one by Brinjes & Goodwin, rolls 22 × 11 in. dia., lateral motion to middle roll; one ditto, front roll 24 × 10 in., back and middle roll 24 × 12 in. dia.—C. F. DAVIS, 22, Billiter Street, London, E.C.

MACHINERY, PLANT, &c., FOR SALE—*continued*

TWO GOOD VIBROMETER SIFTERS, 40 ft. by 8 in. Paddle Worms, 32 ft. by 6 in. Continuous Worm, Plausifter (Dell's) Mixing Machine, 36 in. by 18 in.—Price and particulars from READWIN, 134, High Street, Cheshunt, Herts.

TWO BOILER TANKS for Sale, 32 ft. by 7 ft. 6 in. by ⅜ in. thick, end plates 9/16 in. thick, cleaned and painted. £180 each on rail.—BRUCE, GOLBY & CO., Prudential Buildings, Sheffield.

VENTILATING FAN, 24 in., with electric motor, 400 volts, 7 amp., 810 revs. per min., continuous current, £35. Copper tilting pan, Low & Duff, high pressure steam jacket, copper lid, £45. Portable gas coppers, 50 gall., £6; 20 gall., £4. Carbotron slow combustion stoves, 25s.—MCKENZIE, 26-7, Holland Park Mews, London, W. 11.

WHAT OFFERS for 2 Simons CYCLONE DUST COLLECTORS, 4 ft. diameter, 6 ft. high, in practically new condition. Inspection invited.—READWIN, 134, High Street, Cheshunt.

1 PAIR SELF-CONTAINED MILLSTONES & HURSTING 4 in. dia. French burr; 1 pair 3 ft. diameter and hurstings; both with bevel gearing and all adjustments complete and ready for immediate work.—Price and particulars from READWIN, 134, High Street, Cheshunt.

30 STEEL, CAST-IRON AND COPPER JACKETED PANS, from 2 ft. dia. to 6 ft. dia., 60 lb. working pressure.—C. F. DAVIS, 22, Billiter Street, London, E.C.

MISCELLANEOUS SALES

AMMONIA.—Enquiries Solicited.—BROTHERTON & CO., LTD., City Chambers, Leeds. Works: Birmingham, Glasgow, Leeds, Liverpool and Wakefield.

BICHROMATE OF SODA AND POTASH.—Stocks at shipping ports and Bradford. 150 tons Black Oxide of Iron, £5 10s. per ton, in bags. 5 tons Dimethylaniline, 3s. 6d., delivered. Alphanaphylamine, 2s. 5d., delivered. Aniline Oil, 1s. 6½d. 3 tons Beta Naphthol, 2s. 4d. All British material. Parcels split. We are buyers of stocks of Intermediates, Dyes, and Bichromate.—HULSE & CO., 12, South Parade, Leeds.

FOR SALE.—New iron hampers for 10 gall. carboys, strongest made for trade. Surplus stock, 3s. each makers' works.—JOHN NICHOLSON & SONS, LTD., Hunslet, Leeds.

FOR SALE.—3 tons Barium Hydrate Crystals, £14 ton; 10 tons Hyposulphite of Soda, £20 ton; 5 tons Oxalic Acid Prime White Crystals, 7d. lb.; 5 tons Glacial Acetic Acid, £57 10s. per ton.—Replies to BOX No. 198, CHEMICAL AGE Office, 8, Bouverie Street, London, E.C.4.

KIESELGUHR-DIATOMITE.—Large stocks in different qualities held at all principal U.K. ports.—Enquiries invited.—A. EGGERMONT, Victoria Square Chambers, Middlesbrough.

LIGNITE, Brown Coal Charcoal, 5 tons for sale.—Offers to Box 200, CHEMICAL AGE Office, 8, Bouverie Street, E.C. 4.

TAPS.—Whitworth Threads. Price includes three taps (first, second and third), ¼ in., 1s. 9d.; ⅜ in., 2s.; ½ in., 2s. 6d.; ⅝ in., 3s.; ¾ in., 3s. 3d.; ⅞ in., 3s. 9d.; 1 in., 4s. 6d.; 1¼ in., 5s. 6d.; 1½ in., 6s. 6d.; 1 in., 8s. 6d. Post free. Cash with order. Special terms to trade.—R. & J. LISTER, 49, Deansgate, Manchester.

WHAT OFFERS?—3 cwt. Sublimed Salicyclic Acid; 2 tons Bicarbonate of Soda.—Samples and particulars from Box 191, CHEMICAL AGE Office, 8, Bouverie Street, London, E.C. 4.

ZINC Carbonate for disposal. Enquiries solicited.—BROTHERTON & CO., LTD., Leeds.

MACHINERY, PLANT, &c. WANTED

SECONDHAND, 6 ft. TREPEX NITRE ABSORBER required.—Full particulars, Box 195, CHEMICAL AGE Office, 8, Bouverie Street, E.C.4.

MISCELLANEOUS WANTS

MAGNESIA LIGHT CARBONATE.—Advertiser requires offers and samples, at low prices, for new or good second-hand qualities, delivered free London, in ton lots.—Reply, Box 197, CHEMICAL AGE Office, 8, Bouverie Street, E.C.4.

WANTED,—Radium Salt, Pure or Residues, Old Applicators, &c.—Apply, HARRISON GLEW, Radium Laboratories, 156, Clapham Road, S.W.9.

FINANCIAL

INCREASED COSTS MEAN INCREASED CAPITAL. That capital is most easily procured by converting your Business into a Company. Read "Private Companies: their Utility, and the Exemptions they Enjoy," 1s. 10d., from JORDAN & SONS, LTD., 116, Chancery Lane, W.C.2.

FACTORY FOR SALE

FAT, BONE AND GLUE WORKS FOR SALE, in South Lancashire, well equipped with 80 H.P. steam boiler and engine digestors, rotary driers for manure, vacuum evaporator, &c., 2 acres of land, railway siding, convenient and eligible site.—E. FORSHAW & SON, LTD., Warrington.

SITUATION VACANT

CHEMIST WANTED.—A live, energetic Man required for an Oil, Soap and Chemical Factory in Spain. Excellent opening for a practical Chemist with organising and business ability; Single preferred.—Give qualifications, experience, &c., to Box 201, CHEMICAL AGE Office, 8, Bouverie Street, E.C. 4.

APPOINTMENT

TO MANUFACTURERS OF DYESTUFF INTERMEDIATES
and
THOSE CONTEMPLATING THEIR MANUFACTURE.

ADVERTISER has recently returned from abroad, where for some months he held the position of Assistant Works Manager in one of the world's largest plants producing H Acid, S Acid, Gamma Acid, and some other intermediates.

He is at present engaged in work of another kind, but is willing to act in a consultative capacity to a British firm of repute. Payment by results only.

Write, in strict confidence, to Box 199, CHEMICAL AGE Office, 8, Bouverie Street, E.C.4.

BOOKS

OUR BOOK DEPARTMENT can supply your needs in Technical Books, and places its service at your disposal. Send full information of your requirements to Manager, Book Dept., BENN BROS., LTD., 8, Bouverie-street, London, E.C.4.